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ABSTRACT

The PEACESAT Project (Pan Pacific Education and Communication Experiments by Satellite) has been in daily operation for four years since April 1971. Initiated as an individual research project of a university faculty member, it has expanded to involve educational institutions in 12 countries or jurisdictions in the Pacific Basin. These institutions own and operate low-cost satellite ground terminals using the experimental satellite ATS-1 of the U.S. National Aeronautics and Space Administration. The satellite communication system is designed to support specialists and community leaders who have responsibilities for resolving social problems by linking them with sources of useful information. This report, consisting of contributions from project personnel, and including recorded conversations, transcriptions of PEACESAT exchanges, and occasional reports from the personnel, attempts to provide an insight into the potential social benefits provided from a system of the type used in the PEACESAT experiment. The technical system of the experiment is also briefly explained. (LL)

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PEACESAT PROJECT

EARLY EXPERIENCE

The Design and Early Years of the First Educational Communication Satellite Experiment

REPORT ONE

October 1975 • University of Hawaii
Honolulu, Hawaii

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CS 501180

INTRODUCTION

The PEACESAT Project (Pan Pacific Education and Communication Experiments by Satellite) has been in daily operation for four years beginning April 1971. Initiated as an individual research project of a University faculty member, it has expanded to involve educational institutions in twelve countries or jurisdictions in the Pacific Basin. These institutions own and operate low-cost satellite ground terminals using the experimental satellite ATS-1 of the U.S. National Aeronautics and Space Administration.

PEACESAT is the first education satellite project in the world. Visitors to the Honolulu site often ask us why they did not hear about the project earlier. Although we feel the activities have an important lesson for the world, there has been no organized effort at public information. We have been entirely occupied in developing and sustaining the large number of health, education, and community activities that have depended on this international conference system.

The project has not had big budgets and has been supported entirely by local financial efforts and small private grants. No Federal financing has been used. PEACESAT is the first, and remains the only, international educational satellite network. It is unique among educational satellite projects in its emphasis on two-way communication among equal partners.

The purpose of the experimental satellite communication system is work rather than entertainment. It is designed to support specialists and community leaders who have responsibilities for resolving social problems by linking them with sources of useful information.

This publication is the first of a series of reports on the project. It is intended to stimulate the interest of specialists, administrators, and government officials. We hope to provide an insight into the potential social benefits provided by a low-cost ground terminal system of the type used in the PEACESAT experiment. This report, made up of contributions from project personnel, will be followed by others, largely written by users of the system.

Emphasis will be placed on concrete experience and on the behavior of those who have participated in the operation and use of the system. The experiences discussed are part of the continuing work of health, education, and community services for which the experimental system is designed.

The contributions are brief and informal, for the most part. They include recorded conversations, transcrip-

tions of PEACESAT exchanges, and occasional reports. We have depended entirely on local initiative. The system users are not project personnel reimbursed for their efforts from experimental funds. Their observations are from the viewpoint of persons looking for a better tool with which to achieve professional objectives--better food, health, or education. This disinterest in the experimental system gives their comments special value.

We have had to cover a lot of ground in limited space. There has been over four years of action, with exchanges averaging 18 hours a week among a dozen countries in all manner of human endeavor. We usually condense or excerpt sections and seldom print the whole. From these papers, we hope you will obtain some sense of the experience with this satellite communication system. Perhaps you will have a proposed use which you would like to see incorporated into the PEACESAT experiment.

In the first report we have attempted to explain the technical system. Why is it unique, low in cost, and flexible? How can it benefit mankind? This is an international communication system that is designed to avoid domination from forces outside a country. Its purpose is to link the institutions and individuals engaged in the organized work of the society for their greatest effectiveness.

Much care has been taken in the experiment to make decisions that will provide the greatest social benefits at the least cost. Some people are less impressed than we are with the low cost and functional accomplishments of the technology used in this project. They respond to the more dramatic architecture of costly technology being used in other places and accept the larger budgets as indicative of the social value to be obtained. They feel the rough quarters shown in some of the pictures is evidence of lack of sophistication rather than flexibility. We, on the other hand, find a ground station costing $100, which fits in the palm of a hand, better than one costing $100 thousand, which requires a truck--provided the communications made available are sufficient to the job.

Hawaii students participate with New Zealand and Fiji classes in joint credit university course in Educational Foundations. June 1973.

Sir Albert Henry, Premier of Cook Islands, explains Independence process during transmissions with Saipan. June 1974.

To set the record straight, however, the system projected here, if adequately funded, will provide communication resources to remote locations and in quality, flexibility, and range will be *superior* to those enjoyed today by the top executives of the most advanced countries. And such a system can be accomplished in a very few years.

Per unit costs are not something for which claims should be made at this point. NASA's satellite time is free to the project, and there have been large-scale donations of effort by the persons involved. However, we believe that costs of a future comparable system operated by an experienced carrier can be acceptable at institutional budget levels, which now prevail in the Pacific Basin and throughout the world. Unlike many experiments in educational technology, this one attempts to recognize the limited money supply in less-developed areas and the absence of a market economy to support the operations of education, health, and community service institutions.

In short, PEACESAT operations are designed to fit the existing physical, economic, political, and social conditions of life today.

John Bystrom
Project Director

"The seminar declares its interest and hopes that consultations will be continued to support the extension of the Pacific satellite project to include participation of additional territories and in the interest of education particularly."

Conference Proceedings
Pacific Directors of Education
East-West Center, Honolulu 1972

CONCEPT

Until now, communication systems in the world have been planned and developed for business, trade, political, and military purposes; very little attention has been given to communications for social services. It is assumed that health, education, and community organizations should adapt to the communication systems developed for other purposes.

The PEACESAT project is attempting to determine whether other communications systems should be developed and financed for social services and how to adapt technology to requirements for service. The plan is to provide an experiment system encompassing flexibility, mobility, low cost, wide-area coverage, and two-way transmission. Even though the experimental communications system in operation today has these characteristics, the equipment is limited and the procedures rudimentary.

Need for the System

In all parts of the world, there are human needs depending on the effectiveness of organized health, education, and community services for fulfillment. These services require teamwork. Persons often widely separated in distance must interact, consult, and share tasks; and technology centralized in the large urban centers must be used. As a result, the quality of service is often affected by available communications. Workers in these fields need systems that are low cost, can extend service anywhere, and permit interactive transmission of voice and print among colleagues and professional centers.

In the large industrial nations, as well as in developing countries, when institutions and professionals are remote from centers of information and expert knowledge, standards of service are affected. A well-designed telecommunications system can narrow the gap between knowledge and the application of it.

Today it is becoming increasingly clear that this interaction should be international. Disease, for instance, knows no national boundaries; food shortages in one part of the world affect events in other parts. Small nations, in particular, cannot develop comprehensive health and education services without drawing on information resources from outside the country.

Because of our dependence on the knowledge community, we need effective international communication to strengthen all nations.

- Scientists need to remain in touch with work going on in all parts of the world.

- Researchers should be able to interact over distances from separated work sites.

- Professionals and technicians need links to collections of print materials and to knowledge centers.

- Trained manpower everywhere must remain in contact with current, up-to-date practices.

The needs of the world's people for education, health, and community services justify the development of a new kind of telecommunication system, we believe. The system will not fit precisely into existing classifications of telecommunications, but it will have qualities of all of them.

Purpose

The PEACESAT Project tests a work-oriented system. It is not to be confused with the mass media and with entertainment-oriented communication, although it may assist the mass media in such tasks as the distribution of news. It is not designed to accelerate the rise of expectations among the world's people but rather to assist those who carry the responsibilities for meeting these rising demands.

Harlan Cleveland as University of Hawaii President opens formal traffic at the Honolulu terminal. John Bystrom, Project Director, at left. April 1971.

Primary school cultural exchanges involve students in Alaska, Hawaii, and New Zealand. November 1973.

Characteristics

The important specifications of the experimental system are these:

- local ownership and operation of ground facilities;
- low cost and easily moved facilities;
- multimedia centers with direct access to other centers;
- a global service area, covering one-third of the earth's surface;
- organized networks of users, each with their own rules of operation based on the user's special needs.

It has not been possible to develop the experimental system to its full potential, due largely to lack of funds, but we hope we can develop it more fully in the future. We ask you to consider possibilities based on the experience we report here.

HISTORY

First Phase

Letters were sent by John Bystrom, Professor of Communication, inviting Pacific Basin higher education institutions to participate in the project. A number responded, but after conferring with their post and telegraph agencies, they doubted the feasibility of the project's low cost.

At the University of Hawaii, President Harlan Cleveland determined that a pilot test should be arranged, and he approved funds to initiate two terminals in Hawaii. The National Aeronautics and Space Administration agreed to the use of the ATS-1 satellite.

For the first year, experimentation went on using University of Hawaii ground terminals at Hilo College on the Island of Hawaii and at the Manoa Campus in Honolulu on the Island of Oahu. It was the first intrastate satellite network in the United States.

This experimental period saw a series of world firsts: the first educational credit course anywhere was taught via satellite, and an experiment in networking was the first interconnection of libraries by satellite. Visitors to Honolulu--among them conferees from the Pacific Basin nations attending

meetings at the East-West Center--were able to see the system in action.

Second Phase

The first and still the only international educational satellite network began with the participation of Wellington Polytechnic (New Zealand) in December 1971. This was the result of entirely independent work by Anthony Hanley, Senior Tutor, who had with his students assembled a ground terminal as an instructional project. This terminal became a mainstay in future international experiments.

The University of the South Pacific (USP) (Suva, Fiji) followed, using a grant from the Carnegie Corporation of New York to establish and operate an experimental terminal under the direction of Alan Cutting, Tutor in Physics.

Early experiments included joint instruction of a college course in Educational Foundations by faculties at USP, Victoria University (New Zealand), and the University of Hawaii. An international epidemic control net and a series of food production seminars--all the first of their kind--were initiated. Each was not only an outgrowth of a local need but also an expression of a world-wide need: better food production, security from the invasions of disease, and improvement of education.

Additional stations joined the experiment. Each was locally owned and operated, reinforcing the project specification of local control. The system has been supported entirely with local financing. Despite occasional pressures to the contrary, experimental activities have been selected by local users--health, education, and community service personnel--and the principle largely maintained that communication needs would be determined by the potential users of the communication system.

Tony Hanley, Terminal Manager, and Wellington Polytechnic terminal initiate international networking. December 1971.

Third Phase

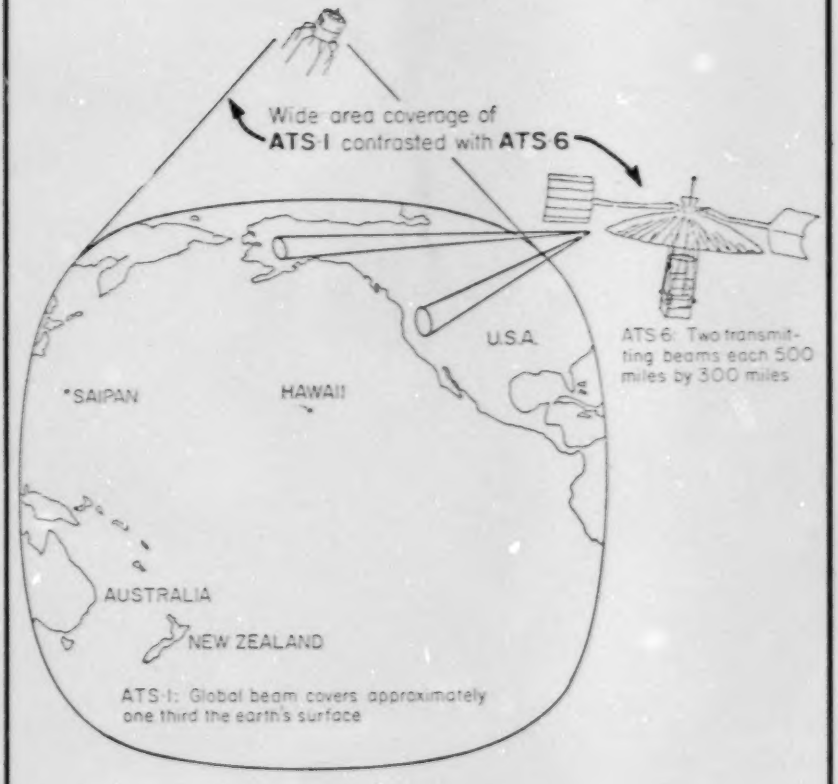
Can the health, education, and community services actually develop enough traffic to warrant the cost of a satellite system? This question has to be answered in the affirmative if any experienced telecommunication operator is to become interested in providing a regular service.

In our view, one of the principal methods for developing the communication traffic necessary to justify investment in even the lowest cost satellite system is in the development of user networks, in which particular categories of users organize network relationships to carry on systematic communications and use joint facilities. The requirements of a large number of such networks could warrant investment in satellite services designed for low-cost ground terminals.

A proposal for a network experiment linking the districts of the Trust Territory of the Pacific Islands was not funded. The first network was initiated by the University of the South Pacific with a Carnegie grant. This Regional Education Net is used daily to carry on tutorial lessons and course work among USP Centres located in six South Pacific nations. It seems clear from the PEACESAT user activities thus far that there are many kinds of networks ranging from international, such as epidemic control, to regional or national networks.

The PEACESAT experiment now includes twelve countries. Costs to date of about $400,000 over four years for all locations is a fraction of the costs associated with later experiments of this kind. This figure is not intended to convey in any way the costs of a regular comprehensive system. The satellite and its operation, for example, were contributed by the U.S. National Aeronautics and Space Administration. However, we believe there is ample evidence to support an extended experiment that could lead to a permanent solution to the shortage of effective communication services.

Hawaii Development Group. (L to R) John Bystrom, Project Director; Abelina Costa, Assistant for Exchange Development; Katashi Nose, Manager, Ground Terminal Development; Paul Yuen, Technical Director. November 1971.


Wide area coverage of
ATS-1 contrasted with ATS-6
U.S.A.
ATS-6: Two transmitting beams each 500 miles by 300 miles
SAIPAN
HAWAII
AUSTRALIA
NEW ZEALAND
ATS-1: Global beam covers approximately one third the earth's surface

EXPERIMENTAL SYSTEM

"PEACESAT's range covers a third of the world from Washington D.C. to New Guinea, from New Zealand to the Arctic....It has potential that seemed best summed by one of its New Zealand supporters..."It will never be a big thing, but it will be a great thing."

Honolulu Advertiser
Editorial May 4, 1975

Satellite

Each communication satellite is designed to meet particular operational objectives. Satellites are not all the same. The ATS-1 used in this experiment has two characteristics essential to the experimental system: (1) it projects a wide beam on the earth surface, and (2) it has a strong power source. With the PEACESAT experiment we have taken advantage of the relatively high power in the satellite by using simple, low-cost ground terminals designed for two-way communication. The wide area of coverage makes possible inter-continental conferencing among persons with like interests or needs.

In the sketch the footprint of ATS-1 is compared to that of the ATS-6, NASA's most recent communication satellite, which has limited coverage and requires very much greater investment on the ground. ATS-6 can relay TV motion pictures from production centers, limited in number, directly to community receivers, something that is impossible with ATS-1. On the other hand, ATS-1 is suited to two-way communication and is adaptable to a large number of mediums such as print, facsimile, computer interconnection, and voice.

The global coverage is illustrated by use of ATS-1. PEACESAT terminals in the Western Pacific have been involved with terminals at the National Library of Medicine near Washington, D.C., and at locations in the State of Alaska. Medical consultation, for example, has taken place among persons as widely separated as New Zealand, Alaska, Washington D.C., and Hawaii.

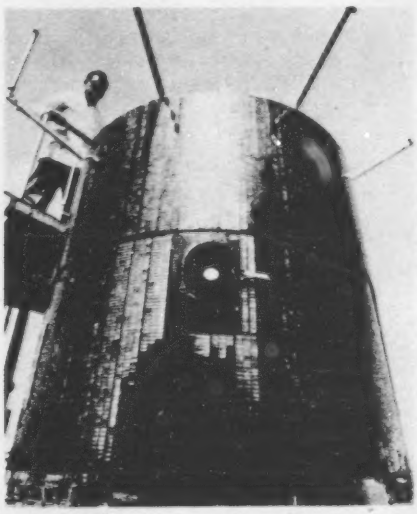
NASA's ATS-1 is one of only two satellites now in orbit that permit the low-cost ground terminal and the wide area coverage used in the PEACESAT experiment.

Ground Terminals

To meet the social purposes for which the system was designed, a small satellite ground terminal had to be created. The first ground terminals were designed and constructed at the University of Hawaii by Paul Yuen, Professor of Electrical Engineering, and Katashi Nose, Associate Professor of Physics, with the cooperation of the College of Engineering. Unique at that time, the terminals met specifications which included low cost, portability, and operation by indigenous personnel. Terminals were to provide two-way communication. All locations were to send and receive.

Tests in April 1971 confirmed the effectiveness of the prototype units, and additional units were constructed with funds voted by the Hawaii State Legislature.

Ground terminals now in use were also constructed by Anthony Hanley (New Zealand), Alan Cutting and Richard Northcott (Fiji), Stuart Kingan (Cook Islands), and Ian Fletcher (Papua New Guinea). Power and performance characteristics vary among terminals. Experience has demonstrated the importance of a high-quality signal, central maintenance, equipment compatibility, and uniform training of personnel. We know low-cost terminals can function effectively in remote locations in the hands of indigenous personnel without technical background, provided appropriate supportive measures are taken.



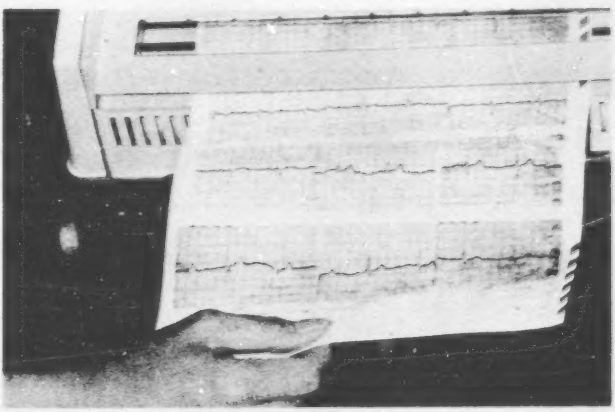
NASA's Applications Technology Satellite (ATS-1) provides Pacific-wide coverage for two-way networking.

Paul Yuen, PEACESAT Technical Director, tests low-cost equipment. March 1971.

Media Combinations

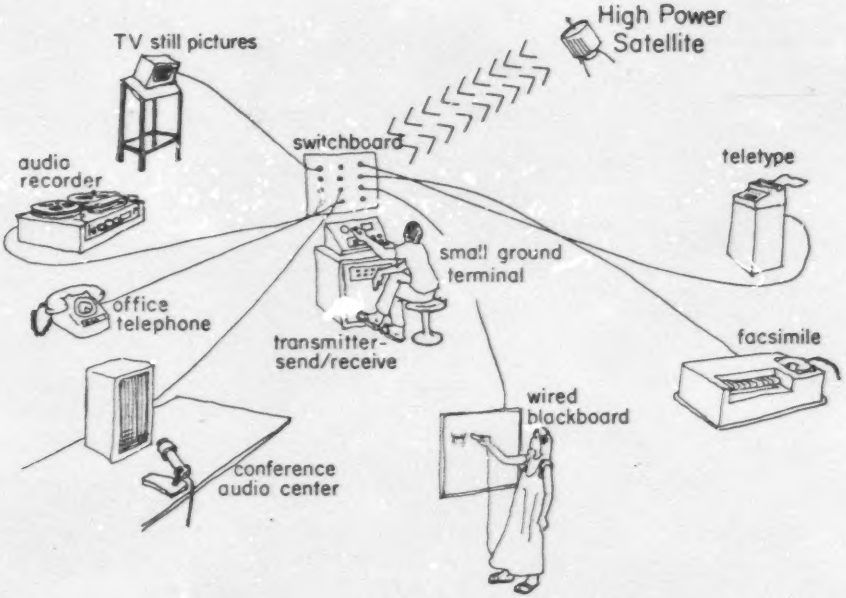
Many mediums can be received and transmitted by the satellite ground terminal. As illustrated, a variety of equipment may be attached. We regard voice, teletype, and facsimile equipment as a desirable minimum for standard exchange centers. Facsimile has been used effectively, especially for medical and library experiments. Thus far, lack of funding has made it impossible to expand services beyond voice and facsimile, however.

As projected, a full-scale exchange center would provide all mediums of communication except for television motion pictures. TV is not included because of the very large additional capital and operating costs and because only a few locations would have facilities to transmit messages by TV. All the equipment illustrated, including computer terminals, is available from commercial suppliers. At a total annual lease cost in the $5-10 thousand range, for peripheral equipment currently available, a center could provide the user with two-way exchange by voice, teletypewriter, facsimile, wired blackboard, still television picture, and, when available, computer accessing. There are many arrangements which are supportable at the budget levels of existing health and education institutions. Incorporation of mediums into the system would have to be justified by use. As yet, it has not been possible to exploit the great flexibility of the experimental system.



The facsimile telecopier offers potential for EKG and X-ray transmission to support medical consulting among widely separated physicians. This copy is received in Honolulu as it is being sent in Wellington. October 1972.

Mediums of Communication in a Narrow Band system



Exchange Centers

In the experiment, the exchange centers are operated part of each day. Usually an operator handles equipment while a senior staff person serves as terminal manager, with general responsibility for community relationships and the development of exchanges.

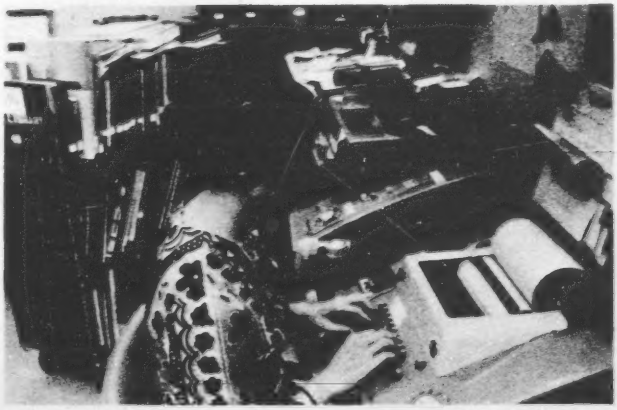
A conference on the system will require several steps: a proposal from one of the terminals, responding agreements from other terminals, system-wide planning sessions, and finally the scheduling of a series of exchanges.

It is an important rule that no request be scheduled without the active involvement of two locations. On learning of the exchange proposal, someone has to agree to participate. Unlike a broadcast station, where the management gatekeepers determine programs for passive listeners, PEACESAT exchanges are scheduled through the interaction of participants. The terminal manager is in the important position of generating participation from his community.

At the future terminal with its many mediums available--facsimile, teletype, computer storage and recall, and more--a message planner will have to be available to assure the individual using the system that the most effective form of message delivery is applied.

In some instances, as with an ocean research activity involving personnel moving from one remote location to another, planning would involve the deployment of additional portable ground terminals.

By centralizing mediums and processes in the exchange center and providing expert guidance, it is possible to support long-distance transmission services and a wide range of media choices which is impossible today with telecommunications designed for casual and unstructured use by the general consumer.



Ellen Chapman, University of Hawaii librarian, uses teletype for quick processing of inter-library loan requests. Satellite links can provide expanded service. August 1973.

"This is a period of great change and growth in world telecommunications. Yet there continues to be vast areas of the globe and important sectors of society that are poorly served. The PEACESAT Project interests me because it attempts to look at human needs and adapt technology to social requirements. It directs its attention to people and the kinds of communication that serve their needs at a cost they can afford."

Fujio Matsuda
President, University of Hawaii
Opening Remarks-PEACESAT Conference
April 1975

Fujio Matsuda, as Hawaii State Director of Transportation, participates in first terminal inauguration representing Hawaii Governor's Committee on PEACESAT. April 1971.

"These experiments in the use of direct satellite communication to aid cooperation between people in the isolated countries of the Pacific Basin show much promise.

The PEACESAT Project has been supported by New Zealand and has resulted in valuable exchanges between groups with special interests in many fields of education.

New Zealand with its concern to assist development in the Pacific region is most interested in all means of improving communication between peoples of the area. The PEACESAT Project is an excellent example of the cooperation that improved communications can bring."

P.A. Amos
Minister of Education
New Zealand

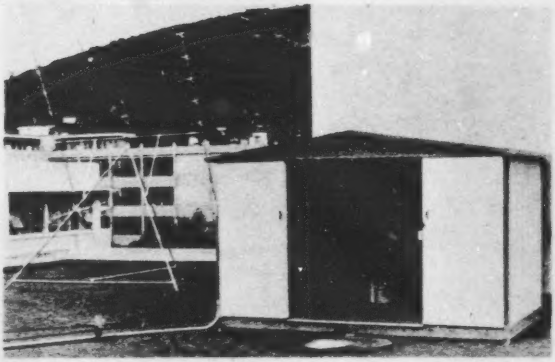
PROJECT GROUND TERMINALS

The system's ground terminals are locally managed and financed, and each is licensed by the local telecommunications authority. Each terminal functions independently within general rules of operation necessary for system-wide relationships.

1 Honolulu, Hawaii

The principal ground terminal in Hawaii is on the Manoa Campus (enrollment 20,000) of the University of Hawaii. Manager of University operations is Carol Misko. Calvin Hirai and Gary Viveiros serve as terminal operators. Support is provided by legislative appropriation. Through interconnection with the telephone system, the terminal is linked to all educational and health institutions in Honolulu (population 630,000) and the island of Oahu. Consultation and instruction is drawn from this pool of trained expertise, one of the largest in the Pacific Basin.

Hawaii students participate in cultural exchange with New Zealand Maori pupils. Carol Misko, Honolulu Terminal Manager, at left. June 1973.



Early Honolulu Terminal provided two-way voice and facsimile communications. April 1971.

2 Wellington, New Zealand

The ground terminal is located at Wellington Polytechnic Institute and supported by allotment from the New Zealand Department of Education. Through arrangement with the Post Office Department, telephone lines link the facility with other locations in the country including the University of Auckland and Victoria University of Wellington. The activity is under the supervision of Anthony Hanley. New Zealand (population 2,900,000) and Wellington, the capital city, (population 350,000) provide essential knowledge resources for PEACESAT experiments.

3 Suva, Fiji

The ground terminal is operated by the University of the South Pacific, located on the site of a former base of the New Zealand Royal Air Force. Terminal Manager is Gilda Benstead with policy direction by Tiresa Malietoa and Peter McMechan. The activity has been supported by the Carnegie Corporation of New York with further assistance from UNESCO and the South Pacific Commission. USP directs a South Pacific Regional Education Network experiment.

Suva (population 55,000) is a center of trade. The Fiji Medical School, for nearly a century, has provided much of the trained medical leadership of the Pacific islands. Suva has one of the first of the Carnegie libraries. Fiji (population 500,000) has been independent since 1970 with Dominion status in the Commonwealth.

Princess Pilolevu initiates Kingdom of Tonga terminal. Margaret Blundell, Lecturer-in-charge, USP Centre, at left. April 1972.

4 Kingdom of Tonga

Planning of the PEACESAT terminal by a group of Tongans in Honolulu began in Fall 1971. It was established at Nuku'alofa, April 1972, when the University of the South Pacific provided a low-power unit for the USP Centre which was under the direction of Margaret Blundell. The unit has been recently upgraded in power. Kaveinga Havea is the Terminal Manager and 'Anau Fanua the Terminal Operator.

Among the international exchanges initiated by the terminal were Poultry Problems and Cultural Patterns. A Poetry Series will be covered in later reports. Daily exchanges provide tutorial support for USP students in Tonga who are enrolled in the Extension program.

Part of the Commonwealth, the Kingdom of Tonga has a land area of 269 square miles and a population of approximately 88,000. Education from 6 to 17 is mandatory.

5 Lae and Port Moresby, Papua New Guinea

First established as a technical experiment at the PNG University of Technology, the ground terminal in Lae was later linked by microwave across the Owen Stanley Mountains to Port Moresby.

Papua New Guinea is a newly independent country. Until September 1975 it was administrated by Australia, under a United Nations Trusteeship arrangement. With a population of 2,500,000 persons spread over a rugged land area of 178,000 square miles, communication is one of its major problems. Probably satellite technology is the only means for establishing effective communication within this area.

Ian Fletcher, Assistant (left) and Steve Seumahu, Terminal Manager, use the Lae, Papua New Guinea, terminal to advance scientific research. October 1974.

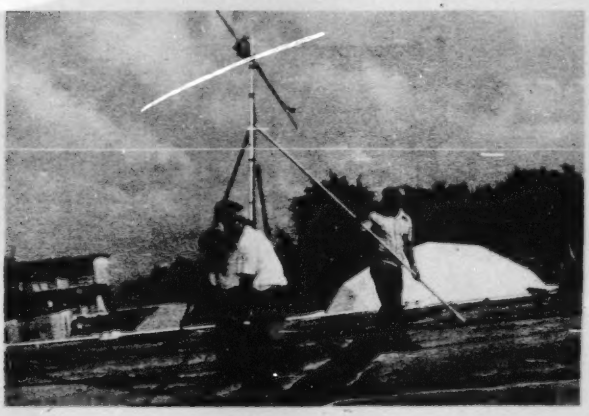
Steve Seumahu heads the project, assisted by Ian Fletcher. Since August 1972, the terminal at Lae has initiated exchanges including an international math competition, a Boy Scout Jamboree, and conferencing on Civil Defense warning systems. A remote village communication project has been initiated and the portable ground terminal is pictured here. While originally licensed by the Australian authorities, with independence, the terminal was licensed by Papua New Guinea.

With the microwave link to Port Moresby a regular feature of operations, the PNG National Broadcasting Commission became actively involved. Coleman Moni became Terminal Manager in Port Moresby. The system was used for international distribution of a PEACESAT message to the people of the Pacific by Prime Minister Michael Somare on Independence Day September 16, 1975.

6 Saipan, Trust Territory of the Pacific Islands

Established in April 1973, the PEACESAT terminal is located in the government headquarters area on Saipan Island. The Trust Territory covers an ocean area larger than the United States with a population of approximately 100,000 persons. It is administered by the United States Department of Interior under the Trusteeship Council of the United Nations.

George Callison, Assistant to the High Commissioner, is the Terminal Manager, and the project functions under the Broadcast Division, Elias Thomas, Director. Among exchanges resulting from TTPI leadership have been Nursing Training, Personnel Management, and Education for Self Government. The terminal provided reports to the Pacific on the results



Katashi Nose (center), Manager of Ground Terminal Development, directs Saipan antenna installation. April 1973.

of the 1975 Pacific Games at Guam. Live reports from the Trusteeship Council meeting in New York and talks in Washington, D.C. have been transmitted to the Honolulu PEACESAT terminal by telephone and relayed by satellite to Saipan for broadcast by all districts.

A health and community service network involving terminals at each of six district or subdistrict locations received strong support, but funding was not approved.

7 Noumea, New Caledonia

The South Pacific Commission (SPC) established a terminal in January 1974 for the purpose of experiments in economic and social development. Pat Mahony, Terminal Manager, is assisted by Fran Mahoney and Beth DuBois.

SPC is an international organization, functioning for over 25 years, made up of the nations and jurisdictions of the Pacific Basin. SPC specialists travel to all parts of the Pacific in support of economic and community development programs, better health, and improved education.

Use by the SPC has been for conferencing of specialists in social welfare and education, epidemic control consulting, and development coordination. Their major experiment in Regional News Distribution by satellite seeks to determine interest and use of South Pacific regional news when available to the mass media. It involves exchanges of stories by reporters in various locations.

New Caledonia, in which the SPC headquarters is located, is a territory of France with a population of 131,000 persons of which 60,000 are in Noumea.

Pat Mahony, Terminal Manager, and Ian Firman, South Pacific Commission, during sessions on agricultural quarantine inspection. June 1974.

Social Science students from the Cook Islands find the satellite serves as an extended classroom. Stuart Kingan, Terminal Manager, at left. June 1974.

8 Rarotonga, Cook Islands

The terminal at Rarotonga is an activity of the Scientific Research Division, Premier's Department. Although ready for operation for over a year, it did not receive approval for satellite use until February 1974. Since then, it has been active under the Terminal Manager, Stuart Kingan, Scientific Officer for the Cook Islands, assisted by Tereapii Kingan. Rarotonga has initiated a number of exchanges, including international meetings of the Girl Guides, in-service training of dental nurses, and conferencing on national museum development.

North of New Zealand, the Cook Islands has been self-governing since 1965 and are linked to New Zealand by a common head of state who controls foreign affairs, defense, and finance. Population is 21,000 with Maoris composing the majority. The 15 islands form a land area of about 93 square miles.

9 Niue

The ground terminal is a cooperative project of the Department of Education and University of the South Pacific. It began operation in April 1974 under Rodney Spooner, Terminal Manager, with Alofa Tafatu, Terminal Operator.

The terminal has initiated international exchanges on compulsory school attendance, small community problems, and English as a second language. It is part of the USP Regional Education Network experiment.

With a population of approximately 5,000 persons and a land area of 100 square miles, Niue has internal self-government status under New Zealand. Education is mandatory from ages 6 to 14. Free government operated medical services are provided.

Niue education and development purposes are supported through information sharing. Rod Spooner, Terminal Manager. July 1974.

Colin Aikman (second from left) opens Honiara terminal at USP Centre in British Solomon Islands. Mostyn Habu, Terminal Manager (far right). August 1974.

10 Honiara, British Solomon Islands Protectorate

Established in August 1974, the terminal at Honiara is primarily concerned with the extension of USP regional education services. Mostyn Habu became Terminal Manager and Hazel Lulei the Terminal Operator.

The protectorate consists of ten large clusters of islands east of Papua New Guinea. The population is approximately 160,000. Principle industries are copra, cocoa, rice, mining, and timber. Missionary leadership is important to education.

11 Tarawa, Gilbert Islands

The ground terminal was activated October 1974 by the University of the South Pacific with the financial assistance of UNESCO and the Carnegie Corporation. Its primary work is in USP extension education. Temaroiti Rameti is the Terminal Manager.

The terminal can be a tool for health and community services. Central Colony Hospital is located in Tarawa. The World Health Organization, United Nations Children's Funds, Colonial Development, South Pacific Commission, and other organizations are concerned with the health of the area.

The Gilbert Islands, until recently, were part of the Gilbert and Ellice Islands, a British Crown Colony with a total land surface of 376 square miles. The population of the group is 53,000.

12 Vila, New Hebrides Condominium

The ground terminal at the Kawenu Training College was activated July 1975 and has only limited participation thus far. Developed by the University of the South Pacific with a UNESCO grant, its planned use is with the Regional Education Network Project, and experiments in international networking are feasible. Roslyne Pedro is the first Terminal Manager.

The New Hebrides groups has an estimated land area of 5,700 square miles and a population of 78,000 persons. It is jointly administered by Great Britain and France.

13 Hilo, Hawaii

The ground terminal at Hilo College (University of Hawaii) was established in April 1971 and joined with Honolulu for a number of tests in education networking. With the completion of these tests, terminal operations were terminated in April 1972.

Maui Community College staff test new terminal. May 1972.

14 Maui, Hawaii

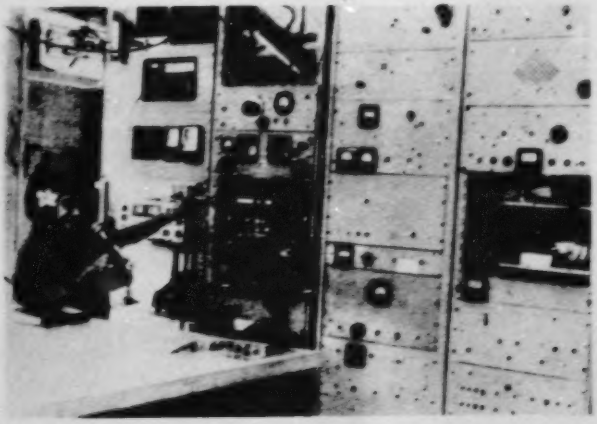
A ground terminal was established May 1972 by Maui Community College (University of Hawaii) at Kahului, island of Maui, under the leadership of Walter Ouye, Director of Community Services. Programs have been initiated in ferro-concrete technology, accounting, and curriculum development. The terminal is currently on stand-by status.

15 American Samoa

A low-power ground terminal was activated and tested at the Educational Television Facility in Pago Pago beginning May 1972. For a year it was used extensively for consultation by the Public Health Services centered at the LBJ Hospital. However, permanent management of the terminal has not developed and it is not currently active.

16 Others

Expansion of experiment members at this stage must be limited. Additional locations in the Trust Territory and Guam have been proposed but not approved. Requests for participation have been received from a number of North American universities; a Canadian university and a California university are under consideration. Three locations in the South Pacific may be added. Participation from an Australian university has been sought, but a license for an experimental satellite ground terminal has never been approved.



Terepii Kingan serves as Terminal Assistant in Rarotonga, Cook Islands, July 1975.

SYSTEM USE AND SOCIAL BENEFITS

Communication is more than technology. The value from investment in telecommunications is in the social behavior set in motion by its use. Any communication system should be judged by what people do with it. What problems are solved? How is life improved?

The group of reports that follow help to explain the use being made of PEACESAT system technology. Each report was prepared for a special audience and each comes from a different part of the world. They were not composed for this publication. However, together we hope they tell the story of the early years of the project.

Our approach has been to hold the door of communication open to the social services and to observe the response. A major problem in the effective application of new technology is that the equipment designers lack knowledge of user needs and responses. At the same time, the opinions of potential users are an unreliable source of data when they lack experience with the technical tools. The PEACESAT project is designed to bring the technology and the users together.

NEW ZEALAND: REPORT TO THE USERS

A review of the PEACESAT exchange schedule provides a picture of the uses being made of the system. It is the sum of these activities that justify the existence of the system. Regularly the Wellington Polytechnic terminal publishes the schedule in its weekly newsletter, which is circulated to interested persons. Two issues of the newsletter are included here to give the reader a glimpse of the variety of communication needs indicated by the users of the system. Also shown is the management and scheduling routine, which assures broad participation in scheduling decisions.

PEACESAT IN WEEKLY REVIEW

FROM: SATELLITE
Wellington Polytechnic Newsletter

Anthony Hanley
Terminal Manager

PEACESAT is a demonstration project. Its objective is to study the benefits arising from direct conference communications between groups with common interest in widely separated countries of the Pacific. Cooperating institutions are linked by low-cost, self-contained radio terminals and a communication satellite relay. Each station is able to communicate simply and easily with all others and send and receive voice and facsimile signals. Teletype and slow-scan television experiments are also planned. This experimental network is available for use by persons and institutions engaged in research, education, health, and other community services.

The network is particularly suitable for informal, conference-type discussions between small panels of speakers at two or more terminals. Observing audiences can also be accomodated. Suggestions for exchange topics are circulated, via the system, and local participants are invited to each terminal. Groups remote from Wellington may be linked by telephone to the terminal.

Exchanges are held most days. An informal atmosphere develops in these discussions, which often lead to a better understanding of each other's problems.

From the Newsletter of April 11, 1975

Planned for This Week

Monday, April 14

University of the South Pacific News: The regular weekly meeting between U.S.P. Regional Centres and the Suva Campus for U.S.P. news and administrative discussions. This PEACESAT time period is used in exchange for the U.S.P. time period 2:00 - 3:00 p.m. Friday, which is more convenient for the South Pacific Commission's PEACESAT News Experiment.	2:00 - 3:00 p.m.
Exchange Proposals and Development: Suggested new exchanges are introduced by terminal managers and discussed. This meeting also is used to review other matters connected with the conduct of exchanges.	3:00 - 3:45 p.m.
Administrative Messages: Messages in connection with exchanges and project management.	3:45 - 4:00 p.m.
Project Director's Meeting: The weekly meeting of terminal managers chaired by PEACESAT Project Director, Dr. John Bystrom. The agenda covers terminal reports, director's reports, and other business.	4:00 - 5:00 p.m.
Special Reports: Reports of specialist committees formed to consider aspects of the project.	5:00 - 5:30 p.m.
Director's Conference: Special meetings, as requested by the Project Director.	5:30 - 6:00 p.m.
Committee Meeting Period: This time is available for discussion between specialist committee members.	6:00 - 7:00 p.m.
Guide Leaders' Training--Brownie Revels: The third in the series of meetings between representatives of the Girl Guides Association in the Pacific. The group in Wellington will include Mary Hopkirk, Executive Director, N.Z. Guides Association; Margaret Tweed, District Commissioner; Sue Lawrence; Diane Willis, and Marilyn Roberts.	7:00 - 8:00 p.m.

Tuesday, April 15

Reviews of Clinical Problems--Tuberculosis: 3:00 - 3:55 p.m.
The latest in the experimental series of meetings between groups of Pacific doctors intended to provide regular discussion and review of topics of concern. This meeting is to be chaired by Dr. Bakani of the Colonial War Memorial Hospital, Suva, Fiji. At Wellington Dr. John Mackay, physician, Wellington Hospital Chest Clinic, will take part.

Alaska-Pacific Information Meeting: 5:00 - 6:00 p.m.
Paul Sherry, Project Coordinator, Tanana Chief's Conference, village network of ATS-1 terminals, will discuss possible cooperation exchanges with Pacific terminals.

Wednesday, April 16

U.S.P. Administrative Messages 2:00 - 2:10 p.m.

Dengue Fever Epidemic: 2:10 - 3:00 p.m.
Another in the series of conferences between dengue research workers and medical workers in connection with the continuing dengue epidemic in the Pacific. Professor Miles and Drs. McGuire and Austin, University of Otago Virus Research Laboratory, will link by telephone from Dunedin to the PEACESAT network for this meeting.

Fresh Water Shrimp Collection: 3:00 - 3:25 p.m.
This period, set aside for minor exchanges, will link Stafford Guest on Niue Island with John Yaldwyn, Deputy Director of the N.Z. National Museum, in Wellington and John Baird, Fisheries Officer, at the South Pacific Commission, Noumea.

Administrative Messages: 3:25 - 3:30 p.m.
Messages in connection with exchanges.

Schedule Confirmation: 3:30 - 3:45 p.m.
Advice of forthcoming planned exchanges.

Thursday, April 17

U.S.P. Administrative Messages 2:00 - 2:10 p.m.

International PEACESAT Consortium Council: 2:10 - 3:00 p.m.
The initial meeting of the Consortium Council to consider application for

membership from the South Pacific Commission, New Caledonia; the University of Technology in Papua New Guinea; and the High Commission for the Trust Territories of the Pacific Islands.

Migrant Education--Options in Migrant Education: 3:00 - 3:55 p.m.

A further meeting in the series on problems associated with the migration of Pacific people to the more developed centres. This series is organized by Dr. Ken Sanbourne and Leon Richards of the Institute of Behavioral Sciences, Honolulu.

Friday, April 18

U.S.P. Administrative Messages 2:00 - 2:10 p.m.

South Pacific Commission News Experiment: 2:10 - 3:00 p.m.

This experimental news exchange, organized by Ian Johnstone of the S.P.C. Radio Bureau, consists of a 3-minute broadcast from each terminal of local news of regional interest. This news is compiled by news media personnel or

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"I believe that this Project has very important potential in terms of the continuing medical education of graduates scattered in different territories of the Pacific. One of the important problems faced is the question of communication, particularly among men who have had training in a specialty, but who are having to function in a relatively small community largely on their own. The organization of continuing post graduate activities through the medium of PEACESAT would go a long way towards dealing with this problem. There is also considerable scope for programmes oriented towards different communities. I think that similar advantages are already accruing from the programme that has been developed in other areas of scientific endeavour."

Ian Prior
Director
Epidemiology Unit
Wellington Hospital
New Zealand

PEACESAT terminal managers, and received news is recorded and made available for local use.

Problems of Public Health Laboratories--
Leptospirosis: 3:00 - 3:55 p.m.
This experimental series in the use of PEACESAT to help develop cooperation between Pacific Public Health Laboratory technologists is organized by the New Zealand National Health Institute's Dr. Ashley Robinson, who will chair this exchange.

Administrative Messages: 3:55 - 4:00 p.m.
Messages in connection with exchanges.

Previous Exchanges

"Guide Leader Training" has begun as the topic for a series of evening meetings initially between groups of leaders in Rarotonga and Wellington but now involving Honiara in the Solomon Islands as well. The series is intended to give leaders the opportunity to discuss training activities in the Ranger, Guide, and Brownie branches of the Girl Guide Movement. Meetings have taken place dealing with series planning and Ranger activities.

A further meeting in the "Reviews of Clinical Problems" series took place when paediatric gastroenteritis was discussed. This meeting was chaired from Fiji.

The University of Hawaii experimental "Communications in the Future" course, which is to involve PEACESAT class meetings and tutorial sessions, had another pre-plan meeting. The intention here is to register some Pacific students able to contribute a local view of Pacific communications to this review course. The University of the South Pacific has decided not to take part in this experiment because of the additional pressures it would place on the terminal facilities at U.S.P., Suva. This is an unfortunate development, and it is hoped that this decision can be reviewed; perhaps some temporary assistance can help U.S.P. overcome this problem.

A series of exchanges on "Organic Waste Digesters" has begun linking specialists from the South Pacific Commission, Noumea; U.S.P., Suva; the University of Hawaii; and the Ministry of Energy Resources, Wellington; with interested groups at other terminals. The topics include methane gas production, production of fish from process effluent, and fertilizer production. Both large and small digester systems are being considered. Meetings have already been held. This series is chaired by Richard Solly of the University of the South Pacifics' School of Natural Resources.

The "Dengue Fever" conference series has been quite extensive and prolonged with meetings at least once a week linking the Pacific Virus Research Laboratory at Leahi

Hospital, Honolulu; the South Pacific Commission's Medical Programme Headquarters at Noumea; and the Virus Laboratory at the University of Otago Medical School in Dunedin with the epidemic centre initially in Suva. Extensive discussions of the development and spread of the disease and control measures and research studies have been held. N.Z. Department of Health medical personnel attended several meetings as background briefing and held some discussion on possible aid measures. Tape cassette recordings of all sessions were borrowed for Departmental review. Doctors at the more remote locations took part in some meetings, and, as a result, preventative mosquito control measures were begun in time to prevent a possible outbreak on Niue. Exchanges took place on four occasions, and all were linked to Dunedin by lengthy toll calls.

The final meeting in the National Education Association's Bicentennial Series of Pan Pacific Satellite programmes was held. This session on "Cross-Cultural Education" was chaired from Fiji with the major contribution from Virgi Chattergee in Honolulu. Groups at the terminals in Rarotonga; Juneau, Alaska; Niue; Hawaii; Fiji; Bethesda, Maryland; Wellington; and Fairbanks took part. Present at Wellington were Ted Simmonds, Bruce Kelly, and Morris Gianotti from the N.Z.E.I.; Fanaura Kingstone of the Wellington Pacific Islands Council; Dan Kelly from Wellington Teacher's College; and Brian Fox from Wilford School.

A new school series began Tuesday with the pre-planning meeting on "Pacific Schools Topics." This meeting, chaired by Tamati Reedy, Inspector of Maori and Islands Schools, Department of Education, Wellington, was intended to find topics of interest to elementary schools in the Pacific. A most lively and enthusiastic meeting eventuated. Very strong contributions were made by staff of the University Laboratory School on the campus of the University of Hawaii. This series seems likely to be very stimulating.

A further brief technical progress report meeting was held discussing the "ALOHA-PACNET Computer Network Project". Dave Wax, project scientist with the ALOHA project and Tim Hesketh of Wellington Polytechnic's School of P.E.T.E. Subsequently, sample data packets transmitted from Hawaii were recorded in Wellington as test material for the Wellington equipment.

Student information sharing covers varied topics of mutual interest. (Photo Warwick Teague.) September 1972.

From the Newsletter of August 1, 1974.

Planned for This Week

Monday, August 5

Education for Self Government: Discussions on arrangements for self government between Sir Albert Henry, Premier, Cook Islands, and senior administrators in the U.S. Trust Territories, Saipan.	12 noon - 2:00 p.m.
Exchange Period (Open)	2:45 - 3:40 p.m.
Administrative Messages	3:40 - 3:45 p.m.
Proposal Enquiries	3:45 - 4:00 p.m.
Project Management	4:00 - 5:30 p.m.
Earth 2020--How to Negotiate with Mother Nature: William Cooper, Professor of Zoology, Michigan State University, gives a public seminar on ecological engineering. Registration is requested at the Polytechnic office. This seminar comes appropriately during conservation week.	6:00 - 8:00 p.m.

Tuesday, August 6

Public Health Laboratories: A pre-planning meeting between representatives of laboratories to decide on common problems in need of discussion.	2:45 - 3:40 p.m.
Administrative Messages	3:40 - 3:45 p.m.
Schedule Confirmation	3:45 - 4:00 p.m.

Wednesday, August 7

Papua New Guinea News Interviews: Journalism students at Wellington Polytechnic from Papua New Guinea conduct news interviews with a spokesman at the University of Technology, Lae.	2:45 - 3:45 p.m.
Pacific News Experiment: The experiment in exchange of Pacific news between terminals conducted by the South Pacific Commission Radio Bureau. This experiment is to be extended to include live news conferences. The King of Tonga has been suggested as a possible subject for an experimental press conference.	4:00 - 5:00 p.m.

Wellington citizens consider earth's future in a question and answer session following a lecture from Honolulu on the Earth in the year 2020. July 1975.

Thursday, August 8

Self Government: Discussions between Professor Norman Meller and Legislators in the U.S. Trust Territories.	2:45 - 3:15 p.m.
Dengue Meeting: Problems of Dengue investigation in Nauru will be discussed.	3:15 - 3:40 p.m.
Administrative Messages	3:40 - 3:45 p.m.
Proposal Enquiries	3:45 - 4:00 p.m.
Creative Writing: This meeting chaired by Margaret Blundell of the U.S. Centre, Nuku'alofa, Tonga, will link writers and poets at Pacific terminals.	4:00 - 5:00 p.m.

Friday, August 9

High Schools Series--Tourism: This session is to be led by the Suva group.	2:45 - 3:40 p.m.
Administrative Messages	3:40 - 3:45 p.m.

"Instant knowledge of overseas expertise in a manner not possible by letter. Avoids the 18-month delay to reach publication."

Mike Duggin
Department of Scientific and Industrial Research
Wellington, New Zealand

"The direct dialogue proved to be much better than that normally achieved by the written word."

E.R. Linsen
New Zealand
Geologic Survey
Wellington, New Zealand

Schedule Confirmation	3:45 - 4:00 p.m.
Pacific News Association: A further planning meeting between the executive of the newly formed association to encourage news service development in the Pacific.	4:00 - 5:00 p.m.
Alaska-Pacific Medical Series: Planning for the experiment in medical conferencing on the epidemiology of some diseases.	5:00 - 7:00 p.m.

Previous Exchanges

Thursday's meeting on "Problems of Urban Renewal" was attended in Wellington by Councillor Ian Lawrence, Chairman of the W.C.C. Housing Committee, Ken Clark, City Planner, Roger Kiddle, Director of Housing, and Stan Rodgers of the Ministry of Works and Development. Other terminals taking part were Suva, Rarotonga, Noumea, Honolulu, and Anchorage, Alaska, where Susan Renwick, Secretary to the Mayor of Anchorage, and LeRoy Williams, Director of Planning, spoke. The Suva group, who were members of an administrative training course from various areas of the Pacific, had Ken Wills as spokesman.

The final pre-planning meeting to decide on the agenda for the "Technology in Industry" conference was held on Friday with participation from Lae, Suva, Rarotonga, Honolulu, Wellington, Noumea, and Anchorage.

Another Friday planning meeting was held early in the evening at 5 p.m. to link Alaska's Dr. Martha Wilson, Director of the Indian Health Service, with medical workers in the Pacific to plan for the forthcoming series on "Epidemiology of Diseases." At Wellington, Dr. Ian Prior of the Epidemiology Research Unit and Mr. Graham Martin of the Post-Graduate Medical Society attended.

Wednesday's planned meeting on "Nutrition of Children" was deferred because of a failure of the high-power amplifier in the transmitter at the Saipan terminal.

The Monday "Earth 2020, Go or Tell" seminar by John Pierce, on transportation and communication was not as well attended as the first in the series, with approximately 20 participating from Wellington. John Pierce was of special interest, in that in his previous position as

Director of Communications Research at Bell Laboratories he had arranged for the Initial Echo Satellite relay experiments. His comments on the PEACESAT network and the lack of research on teleconferency systems were of particular interest. He was surprised by the PEACESAT project and recommended publications of a review article for science in Scientific American to produce a more general awareness of this project.

The transcription of the topics of the "Earth 2020" session on Population and Energy/Resources problems has been passed to The Listener in the hope that an edited transcript may be published in that periodical. One of the objectives of the PEACESAT project is to produce a public awareness of what such systems make possible.

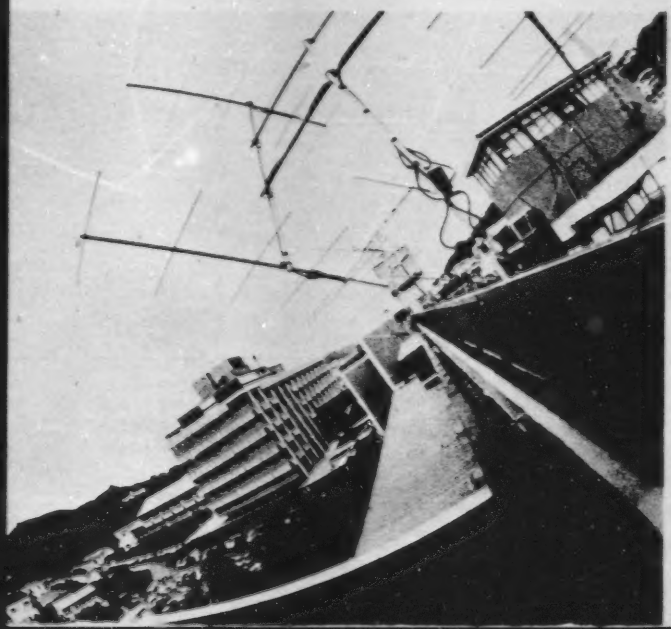
Francis (Fran) Mahoney, who has recently been appointed Social Welfare Advisor to the South Pacific Commission Headquarters, Noumea, has been asked by Frank Mahony, Director of Social Programmes, to take a special responsibility for the PEACESAT terminal operations in Noumea.

Mr. P.H. Lucas of the Department of Lands and Survey has requested a pre-planning meeting on "National Parks and Conservation" in preparation for the conference on this topic to be held in New Zealand in February, 1975.

With the beginning of the new Alaskan school year in late August, Dave Evans, Headmaster of Beaver School, has suggested more school-to-school contacts between Alaskan and Pacific schools.

The "Earth 2020" series has resulted in the formation of a study group in Honolulu to follow on from the discussions initiated by the satellite-linked seminars.

Alan Cutting is to travel in the near future to Honiara in the British Solomon Islands to install the U.S.P. terminal at the University Center there.



Satellite antennas bring new perspectives to Wellington Polytechnic. (Photo Warwick Teague.) September 1972.

HAWAII: REPORT TO THE LEGISLATURE

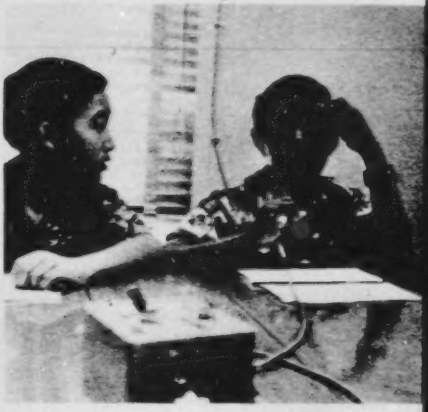
The PEACESAT activities in Hawaii have been supported by special legislation beginning in 1971. The memorandum reproduced here is of interest because it lists the organizations involved in the Project, a very large number indeed. We think this list indicates something about the value of the system.

Undoubtedly, we did not record all the sources of funds and aid outside Hawaii because not all was known to us. The Hawaii legislature has appropriated funds for the project on three occasions, a total of $185 thousand over five years. This has constituted the largest single source of support. The project is unusual in the absence of Federal government financing.

PEACESAT terminals, including those outside the United States, have donated communication services without reimbursement when requested by individuals and units of government. This use contributes to experimental data since it is an indicator of need for communications.

Looking beyond the experiment, however, the questions arise: Who will be authorized to use the system and who will foot the bill? The present practice of local financial support is not equitable when related to current use. It is evident also that a system of this kind, when it moves beyond the experimental phase, cannot be supported entirely from local resources.

American Field Service exchange students, University students in a course on Educational Foundations, and Hawaii elementary school pupils engaged in two-way information sharing.



"I strongly support the objectives of the PEACESAT program and feel that it can have a significant influence on the development of improved and less costly telecommunication links between Hawaii and the rest of the world."

John Burns
Former Governor of Hawaii
November 4, 1971

University of Hawaii at Manoa

Communication Program
PEACESAT Project
2560 Campus Road • Honolulu, Hawaii 96822
Cable Address: UNIHAW • Telex 723567

MEMORANDUM

TO: Senate Committee on Higher Education

FROM: John Bystrom
Director, PEACESAT Project

SUBJECT: Cooperative Participation

DATE: March 3, 1975

Listed below as requested are agencies that have actively participated in the PEACESAT project during the last 18 months.

Cooperating Agencies

The PEACESAT project involves funding and authorizations from a great variety of institutions in many countries. The following list indicates the kinds of agencies involved. It is not a complete list.

1. Hawaii State Legislature
2. University of Hawaii
3. Federal Communications Commission
4. United States National Aeronautics and Space Administration
5. Carnegie Corporation of New York
6. Department of Posts and Telecommunications, Government of Fiji
7. New Zealand Post Office
8. Department of Posts and Telegraphs, Papua New Guinea
9. Department of Posts and Communications, Cook Islands
10. Radio Department, Niue
11. United States Department of Interior
12. South Pacific Commission
13. Kingdom of Tonga Department of Telephones and Telegraphs
14. Posts and Telecommunications Department, Government of Gilbert and Ellice Islands Colony
15. Department of Posts and Telecommunications, British Solomon Islands Protectorate
16. Wellington Polytechnic Institute
17. MacKenzie Foundation, New Zealand
18. National Library of Medicine
19. University of the South Pacific
20. Papua New Guinea University of Technology
21. Education Department, American Samoa

22. Office of the High Commissioner, Trust Territory of the Pacific Islands Government
23. Scientific Research Division, Premier's Department, Cook Islands
24. Department of Education, Niue Island
25. National Broadcasting Commission, Papua New Guinea

Agencies Using the System

The experimental satellite communication system has been used by a variety of education, health, and community agencies to provide conference exchange over wide areas. Among the agencies that have used the system are the following:

Federal Agencies

1. Department of Defense (Advanced Research Projects Agency Net)
2. National Oceanographic and Atmospheric Administration
3. Department of Interior (Earth Resources Project)
4. Department of Agriculture (Extension Service)
5. Department of Health, Education, and Welfare (National Institutes of Health)
6. Department of State (Center for Cultural and Technical Interchange between East and West)
7. National Aeronautics and Space Administration
8. Atomic Energy Commission

Hawaii State Agencies

9. Department of Education
10. Department of Health (Nutrition Branch)
11. Department of Agriculture
12. Family Courts and Children's Youth Services Division
13. Civil Defense Division of the Department of Defense
14. Department of Health (Laboratories Branch)
15. State Parks Division of Department of Land and Natural Resources
16. Department of Personnel Services
17. State Center for Science Policy
18. Model Cities Project (State Foundation on Culture and the Arts)
19. Department of Transportation (Airports and Highways Division)
20. University of Hawaii (Students, Faculty, and Administrators)

Honolulu City Agencies

21. Fire Department
22. Civil Service Department
23. Department of Parks and Recreation
24. Urban Renewal Department
25. Police Department
26. Mass Transportation Services of Department of Traffic

Educational Institutional Participation

27. University of Hawaii (Manoa, Maui, Hilo)
28. University of the South Pacific
29. Wellington Polytechnic Institute
30. Papua, New Guinea, University of Technology
31. Department of Communication, Trust Territory of the Pacific Islands
32. USP Center and Department of Education, Kingdom of Tonga
33. Department of Education, Niue
34. Scientific Research Division, Cook Islands Government
35. USP Centers at Honiara, Tarawa
36. South Pacific Commission
37. Behavioral Science Research Institute, Honolulu

Hospitals and Clinics (Professional Schools)

38. Children's Hospital
39. Kahuku Community Hospital
40. Kapiolani Hospital
41. Tripler Army Medical Center
42. Queen's Medical Center
43. Shriner's Hospital for Crippled Children
44. Colonial War Memorial Hospital, Suva, Fiji
45. Wellington Hospital, New Zealand
46. Maui Memorial Hospital, Maui
47. Straub Clinic
48. LBJ Medical Center, American Samoa
49. Fronk Clinic
50. Leahi Hospital
51. Vaiola Hospital, Kingdom of Tonga
52. Agnau Memorial Hospital, Lae, Papua New Guinea
53. Dr. Torres Hospital, Saipan
54. New Zealand Obstetric Hospital
55. Fiji School of Nursing
56. UH School of Medicine
57. Hilo Hospital

Professional Associations

58. Public Relations Society of America
59. American Personnel Management Association
60. National Education Association
61. Hawaii Dental Association
62. Speech-Communication Association

Community Organizations

63. Parents-Teachers Association
64. American Field Service
65. Pacific and Asian Affairs Council
66. American Cancer Society
67. Boy and Girl Scouts of America
68. John Howard Association
69. Waikiki Drug Clinic
70. Red Cross

"The general organization of management of change through the various programs that are envisaged to be constructed and developed in this area will have to be looked at in terms of regional organization, regional people, regional programs that are in existence at the moment. What will be done and who will do these things is very important to us."

Tiresa Malietoa
Director
Extension Services
University of the
South Pacific
Suva, Fiji

FIJI: REPORT TO A FOUNDATION

The participation of the Univeresity of the South Pacific in the PEACESAT Project was made possible by a grant from the Carnegie Corporation of New York, using funds dedicated to Commonwealth nations.

USP is one of only two international universities in the world that have as their mission the provision of educational opportunity to citizens of more than one nation. Colin Aikman, first Vice Chancellor of the multi-national university, visualized use of the satellite for sharing costly resources with other institutions and for interconnecting the extension centres located in cooperating nations with the main campus at Suva.

Alan Cutting, then Terminal Manager at Fiji, with David Berkowitz, a Peace Corps Volunteer at USP, are authors of the first-year report to the Carnegie Corporation, which is excerpted here. Since this report, USP has provided leadership in developing ground terminals in the South Pacific with funds obtained from Carnegie Corporation and UNESCO. Some of these terminals are under full management of the University, and all are part of the Univereity's Regional Education Network experiment, which has great importance for the future.

EXPERIMENT IN INTERNATIONAL EDUCATIONAL COMMUNICATIONS

Alan Cutting, Project Manager
David A. Berkowitz, Project Consultant
University of the South Pacific
Suva, Fiji

Exchanges of material via the PEACESAT link held from February 1971-March 1972 fall into several broad classifications: group discussions and seminars, classroom uses, and person-to-person exchanges.

Group Discussions and Seminars

In this type of exchange, groups of people gather at two or more terminals, and discussion of a prearranged topic takes place. Exchanges have included:

1. A series of 14 seminars between students in education courses at the University of the South Pacific and the University of Hawaii. Tony Hopkin, U.S.P. Lecturer in Education, was the Suva coordinator for the series, and Professors Frank Brown, Ralph Steuber, Sol Jaeckel, and Edward Beauchamp arranged the Hawaii group. Some of the topics discussed were traditional societies and education; history vs. social studies; the new technology; problems in South Pacific education; and a non-indigenous teaching force in a developing country: cross-cultural testing.

2. A three-way discussion between Wellington, Honolulu, and Suva was held on the subject of "Destruction of Coral Reefs by the Crown-of-Thorns Starfish." Some 30 scientists and researchers from the University of Hawaii, U.S.P., and the New Zealand Oceanographic Institute exchanged material and ideas.

Initiators of USP participation. Alan Cutting, Terminal Manager (left), and Colin Aikman, Vice-Chancellor of University of the South Pacific. August 1972.

The University of the South Pacific, Suva, Fiji, is one of two multi-national universities in the world. June 1972.

3. A series of botany discussions, dealing with various aspects of Pacific flora and fauna, were held. Thelma Richmond and Suliana Siwatibau of U.S.P.'s School of Natural Resources spoke with colleagues in Wellington and Hawaii to compare species and conditions in the three countries.

4. Meetings between student association leaders discussed areas of common interest. Setoki Ceinaturaga, President of the U.S.P. Students' Association, and members of the Student Council plan to hold a series of exchanges on such matters as the structure of student governments; the financing of student activities and facilities; dealings with university administrators; and New Zealand aid for U.S.P. students.

5. Officers from the Fiji Department of Agriculture and the Koronivia Agricultural Research Station (Fiji) took part in numerous seminars and discussions on the agricultural extension program; information services; rat damage in coconut and sugar plantations; and newsletters and group activities. More such discussions are planned, with all network stations participating.

6. Following a discussion on a recent South Pacific Commission Conference on the subject of "Education for Conservation," a series of sessions is at present under way, involving all network stations, to help promote awareness of conservation problems facing the region. Tom Kennedy, of the New Zealand Education Department, is general chairman for the series. Helped by Dr. Kazimierz Wodzicki of New Zealand's Department of Scientific and Industrial Research, Dr. Jerry Johnson of the University of Hawaii Environmental Center, and Dr. John Ackerman, John McLean, and others in Suva, the group have, among other things, formulated plans to present to the South

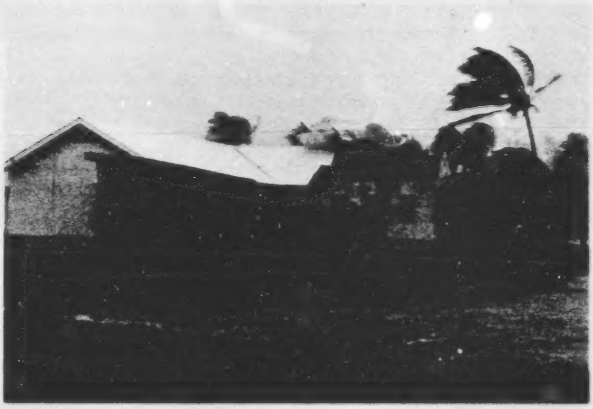
Pacific Commission a case for a conference to be held in the near future on this vitally important topic.

7. A lively debate on the effects of tourism on Pacific territories was held between staff and students in Suva and Hawaii. U.S.P.'s Sione Tupouniua and Ron Crocombe had very different ideas from those of a group from U.H. This led to a stimulating discussion.

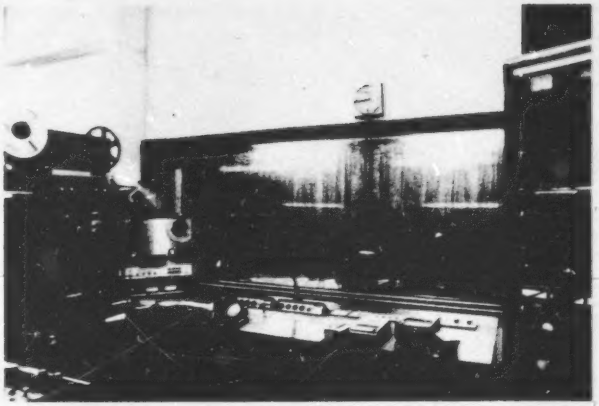
Experience has shown that some care is required in the preparation and management of this type of seminar, particularly in cases where more than two terminals are involved. Here it is easy for two participants to engage in conversation on an issue and for other listeners to be "forgotten."

With the present system it is not possible for stations to interrupt one another, and so the following general procedure has been adopted for multi-terminal exchanges:

- A short pre-planning session, prior to the actual exchange, is held, with the interested terminals supplying one or two people for this.
- At this session, a general seminar format is decided, a seminar chairman is chosen, and, if possible, an agenda is drawn up and circulated.
- During the actual seminar, terminal controllers endeavor to limit transmissions to 2-3 minutes before passing back to the session chairman.
- The chairman ensures that all participating stations are called at frequent intervals to allow them opportunity for comment.



Hurricane Bebe rips roof off the satellite terminal with wind speeds up to 80 mph. Communication was reestablished within three days. October 1972.



Suva, Fiji, terminal is used jointly by University of the South Pacific and South Pacific Commission Radio Bureau. May 1975.

PEACESAT in the Classroom

1. Correspondence students in Tonga, enrolled in U.S.P.'s external Diploma in Education program, hold regular tutorial sessions with their lecturers in Suva. Four correspondence courses are run at present. These are, with the appropriate lecturers shown in parentheses: education (Gordon Wynne); English (Andrew Robson, Adel Nair); mathematics (John Porritt, Helen Dalmaso); and Pacific history (Noel Rutherford, Lionel Brown).

At present, Tongan students come into the U.S.P. Centre for a half-hour session in each subject per month. In these tutorial sessions they are able to discuss assignment work and problems--a privilege previously available to Fiji students only. The effect of this "added help" is only likely to be realized when the final assessment is made at the end of 1972. Students have taken some time to become accustomed to the system, but now, after some two months of operation, they are feeling more comfortable before the microphone, and questions come much more freely.

2. The satellite link provides an opportunity for a lecturer at one terminal to talk directly to a class at another location, with the chance for questions to be answered from listeners. Some preparation is needed for this, and printed material, transparencies, and other visual aids, need to be sent out in advance if full benefit is to be derived. However, on the few occasions on which this has been attempted, results have been most encouraging.

Professor Victor Stenger, research physicist at the University of Hawaii, gave a lecture to an audience of 60 first-year students in U.S.P.'s School of Natural Resources. Dr.

John Williams handled the program from the Suva end, and, after the lecture, students spoke directly to Dr. Stenger and questioned points raised.

On another occasion, after the May 1972 Fiji elections, Dr. John Chick, Reader in Politics in the School of Social and Economic Development, spoke to a group of senior students in Hawaii taught by Dr. Norman Meller, who had been following the election's progress. In two sessions he was able to discuss with them the outcome of the election and speculate on its effect on Fiji's future.

3. A United Nations team, based in Suva and working on curriculum development in the secondary schools of the South Pacific, is able to communicate with teachers in Tonga who are using trial material with their pupils.

Individual Person-to-Person Exchanges

The opportunity for specialists in a particular field to communicate with others working in the same field can be a great asset to people in relatively isolated areas. PEACESAT has provided the opportunity for direct contact between such people, and reports from them have been very favorable.

1. Dr. Prem Prasad, a geographer from Suva, was able to call on colleagues at the University of Hawaii for assistance with material for course work with first-year students in the School of Social and Economic Development.

2. Dr. Leon Rosen in Hawaii, tracking the occurrence of dengue fever throughout the South Pacific, consulted with Dr. Ian Wilkinson and Dr. Michael Ross of the Colonial War Memorial Hospital, Suva, who were able to help in his work.

3. Dr. David Nedwell, U.S.P. microbiologist, is concerned with the effects of sewage pollution in lagoons and on coral reefs. Through discussions with Hawaii scientists dealing with the same problem, he has been able to exchange materials and ideas that have proved helpful to all concerned.

4. Many other topics have also been discussed, including tropical birds; infra-red air photography; fisheries research; oceanography; Indonesian language teaching; ferro-cement technology; natural product chemistry; and computer science.

Evaluation of Operations

It is possible for the person using the PEACESAT network, or a person among the group of users during a particular ex-

change, to be the operator of the system. However, we have found it more satisfactory to have an operator present who is not otherwise involved in what is being transmitted. The system is simple to operate. But it takes from 3-10 hours before a person previously unfamiliar with two-way radio equipment can comfortably operate the system without having it detract from the effectiveness of the program in which he is also a participant. Our procedure is to have the operator initiate and terminate all exchanges, and to stand by during exchanges to monitor them, rotate the receiving antenna to follow signal polarization changes, receive or send facsimile transmissions, tape record the exchange, and switch the equipment between the receiving and transmitting modes.

The simplex communication system has not proven to be a disadvantage in the actual interchange. In fact, the discipline associated with the necessity to say "over" or in some other fashion identify the next person to speak, tends to make participants frame their own statements more concisely, be more sensitive to others who might wish to speak, and be more attentive.

We do not know if the ability to interrupt will improve the effectiveness of communication. It would certainly be helpful to be able to alert others in the network of a desire to speak. This would require a duplex capability.

Unstructured interchanges among more than two terminals of the network are unsatisfactory. PEACESAT is not the equivalent of a roundtable discussion in which all participants are equal and the flow of communication among them evolves naturally and is influenced by other factors such as sight and seating arrangement. PEACESAT requires a structure. Someone must be chairman for each interchange and coordinate the program as it proceeds. Thus the format, as well as the

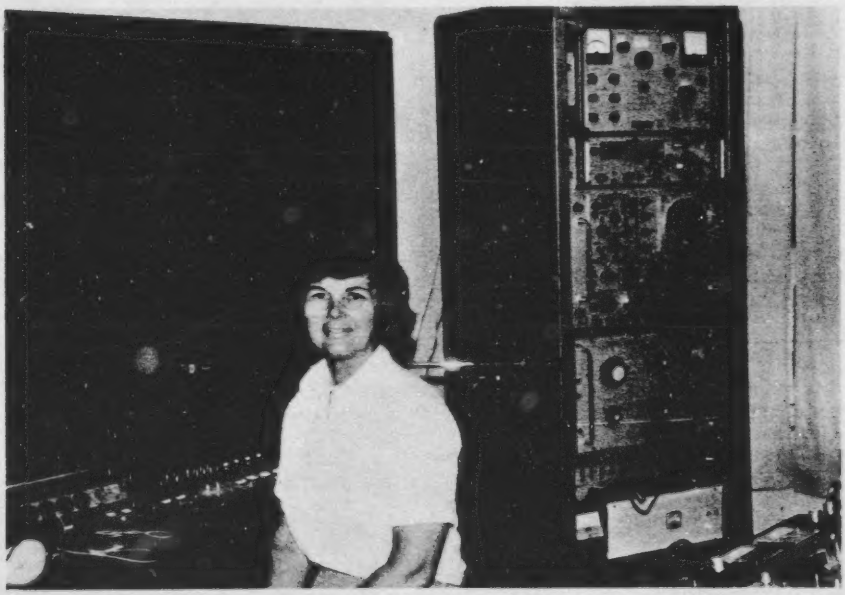
USP students participated in early terminal development. David Berkowitz (far left), Peace Corps volunteer and technical consultant, assisted Alan Cutting (second from right) in early planning efforts. March 1972.

subject matter, must be planned in advance for multiple exchanges and agreed upon by all participants.

Psychological Effects

Among the many users of PEACESAT, some have been experienced radio operators, but most have been unfamiliar with two-way radio equipment, and some even feel strange with telephones. Most users have an initial hesitancy to overcome. In some cases they are virtually unable to speak. But after just one or two tries, and the encouragement of a friendly voice from the other end, the difficulties are overcome. It has proved very useful to have new users observe a program before they participate themselves.

A problem is often encountered with users struggling to understand the accents of those to whom they are talking. Indigenous Pacific Islanders, to whom English is a second, often third, language, are particularly susceptible to this difficulty. It would seem that the problem is somewhat more pronounced than with face-to-face communication. Participants are therefore advised to speak as slowly and clearly as possible.



Gilda Benstead, Terminal Manager, University of the South Pacific. September 1975.

TRUST TERRITORY: REPORT TO THE PUBLIC

The close relationship of the project to the social services and to civil administration is shown in this description by George Callison of the early involvement of the Trust Territory of the Pacific Islands in the PEACESAT Project. The article is a condensed version of one appearing in the Micronesian Reporter, Fourth Quarter, 1974. TTPI activity was initiated with the objective of linking the six districts; however, the necessary approvals for the Territory network were not obtained. This has limited involvement largely to Territory headquarters on the island of Saipan.

PEACESAT: COMMUNICATION BY SATELLITE FOR MICRONESIA

FROM: MICRONESIAN REPORTER
FOURTH QUARTER 1974

George Callison
Terminal Manager-Broadcast Division
Saipan, Trust Territory

Micronesia today has a modern radio-telephone system that accomodates both voice and teletype messages between Saipan and the other five district centers of the Trust Territory. Each district has its own radio broadcasting station and its own telephone system in the district center. Users can, with reasonable dependability, talk with other persons anywhere in the world. Amateur radio operators can set up ham radio links with almost any other location. Jet aircraft whisk written communications to all districts and around the globe.

But the most dramatic and sophisticated communications system, and surely the one with the greatest potential for far-reaching educational and sociological effects, is a satellite system joining Saipan with a dozen other island nations of the Pacific Basin, known as PEACESAT... The Trust Territory, through its Saipan terminal, can communicate easily by both voice and Xerox facsimile with 12 other terminals strung out from Hawaii on the east to Wellington, New Zealand on the west...The entire package of equipment at the Saipan terminal, which gives the Trust Territory one of the strongest voices in the system, cost about $4,000--a far cry from the multi-million dollar figure customarily associated with satellite communication.

Specialists in agricultural practices from all parts of the Pacific Basin meet regularly over the system. Bermin Weilbacher, former Chief of Agriculture, and Leo Migvar, Assistant Chief of the division, have partic-

ipated in a number of exchanges, chairing the discussions in some of them. Others who have taken part in scheduled exchanges are health directors, newspaper editors, municipal government representatives, librarians, educational administrators, and a variety of citizen groups. Dr. Masao Kumangai, Director of Health Services for the Trust Territory, David Ramarui, Director of the Department of Education, and Dan Peacock, Education Department Supervisor of Library Services, have participated in several such exchanges.

Exchanges come about only after a formal request has been made for one by a terminal and at least one other terminal has found the discussion subject to be of value. A discussion chairman is selected, an agenda developed and, particularly in the case of a proposed series of exchanges, participants engage in at least one pre-planning session.

Trained personnel for health, education, and community functions are a prime requirement in many of the terminal locations. The use of long-distance telecommunications rather than costly travel has the potential for major social benefit. The system has been used effectively in training exercises involving nurses--among them, some from Dr. Torres Hospital on Saipan--librarians, and agriculture extension agents...

A smouldering epidemic of dengue fever has been followed for over two years as it has worked its way north from New Caledonia. John Hedderick, Trust Territory Health Services Department, conferred regularly via PEACESAT with Drs. Duane Reed and Duane Goebler, medical researchers who still roam the Pacific in search of data to assist in containing the epidemic, when it was feared the disease might spread into the Marshall Islands by way of Nauru. An epidemiologist was sent to Majuro from Suva, Fiji, to assist in the Marshall Islands research, but although a few cases were positively diagnosed as dengue fever, an epidemic which Dr. Reed predicted the Trust Territory could not avoid, has not materialized.

Diagnostic consulting, test arrangements, and the responsive movement of men and materials has been facilitated by a communication system that links the National Institutes of Health in Washington and the Pacific Research Section in Honolulu with locations in the South Pacific and the Trust Territory. Experiments are planned to use PEACESAT to coordinate research and extension management efforts of marine and fisheries personnel throughout the Pacific and to investigate oceanographic and meterological phenomena in the Pacific Basin.

Like all terminals, Saipan has originated exchanges that are unique to the system. One, which has been used two years in succession and is expected to be repeated this spring, was the daily reporting of proceedings at the United Nations Trusteeship Council meeting via satellite. Jim Manke, at that time Chief of the Public Information Division, prepared his story of the day's activities and telephoned the Honolulu PEACESAT terminal in the evening from New York. In Hawaii, Manke's call was patched into the

PEACESAT system. The report was tape recorded at Broadcast Center, location of the Saipan terminal, for use both by the Micronesian News Service and for duplication and distribution to the six Trust Territory radio stations. The stations in districts other than the Marianas still had to depend on air mail delivery of the tapes, but on several occasions the Saipan radio station, KJQR, used the report from the United Nations within an hour of the time the story was voiced in New York.

The Task Force on Education for Self Government (ESG) looked upon PEACESAT as a means of contacting other Pacific nations that had gone through the political change from trusteeship to some other status, and felt an exchange with some of these nations should prove beneficial. Two such exchanges were held; the first involving New Zealand, Fiji, and Papua New Guinea, from which the Task Force gained much valuable information. The second exchange offered Task Force members the rare honor and privilege of carrying on a 2-hour discussion via satellite, with Sir Albert Henry, Premier of the Cook Islands, an island nation similar in many ways to Micronesia, that is linked with New Zealand in a free association relationship.

How did the Trust Territory become affiliated with the PEACESAT project? A group of Broadcast Division trainees were the first to catch the satellite fever. They came back to their station in Micronesia from the East-West Center at the University of Hawaii, wildly enthusiastic over the possibility of a Pacific Basin news network about which Dr. John Bystrom had told them as they witnessed a PEACESAT demonstration. The writer had a similar experience resulting from conversations with Dr. Bystrom at a Communication Seminar sponsored by the East-West Center later that same year. From that point on,the Broadcast Division of the Public Affairs Department led the way toward Trust Territory participation in the project. On June 11, 1972,

Medical consulting and health in-service training have been among prime uses of Saipan terminal. George Callison, Terminal Manager, inspects new ground terminal. April 1973.

Nurses in Saipan, Trust Territory of the Pacific Islands, participate with Hawaii, New Zealand and Fiji in in-service training via satellite. June 1973.

High Commissioner Edward E. Johnston received a letter from Dr. Harlan Cleveland, President of the University of Hawaii, inviting the Trust Territory to become affiliated with the PEACESAT project. The Hicom enthusiastically accepted the invitation. Mr. Johnston has since participated in exchanges from both the Saipan and Honolulu terminals. However, ten months were to pass before licensing was accomplished, a permit to use the system was granted by NASA, and the terminal equipment was received on Saipan. Professor Katashi Nose of Hawaii came to Saipan to perform the technical work required to get the terminal "on the air" and, assisted by broadcast technicians Charles Singletary and Jesse Biluk, he finished the job in a day and a half. On April 16, 1973, Saipan's terminal on the Pacific Basin satellite network--KUP-71-PEACESAT--was tested successfully.

Incidentally, that idea of a news network which so excited the Broadcast Division trainees three years ago at the East-West Center finally materialized during the summer of 1974, but not quite as it had been planned originally because additional ground terminals in the other five districts of the Trust Territory had not yet been realized. However, the 1974 experiment, originated by Ian Johnstone of the South Pacific Commission, did result in weekly news exchanges among the then eleven terminals. The Micronesian News Service frequently used items from these exchanges, and tapes of the news programs were broadcast on all six of the Trust Territory radio stations. In Rarotonga, Cook Islands, the reports were published in the local newspaper.

Possible further expansion of the network is being considered to include terminals in such locations as Nauru, New Hebrides, Western Samoa, and Port Moresby, as well as in the other five district centers of the Trust Territory. Enough channels would be available so that a Trust Territory medical information consulation and training network, long a dream of Dr.

Kumangai, might be possible, as might also a Micronesian news network, or the linking of all districts in classroom instruction, Education for Self-Government, and other community service programming.

Much more planning, discussion, and negotiation will be needed before such a satellite network can become a reality. Meanwhile, the PEACESAT project has demonstrated incontrovertibly that communication by satellite does have a place in the developing island nations of the Pacific Basin, and that continued experimentation with such a system can reap immeasurable benefits for its users.

In Saipan a remote unit was placed in the office of Dr. Masao Kumangai, Director of the Health Services, Trust Territory of the Pacific Islands. April 1973.

"Micronesia has a need for medical training information exchange, consultation, epidemic surveillance and control, which because of its widely scattered and sparsely populated islands and its limited financial resources, is extremely difficult to meet satisfactorily. The many productive and helpful medical exchanges on PEACESAT in which members of my staff and I, as well as Dr. Torres Hospital personnel, have participated strengthens my conviction that satellite communication plays an important part in our communication system."

Dr. Masao Kumangai
Director, Department
of Health Services
Trust Territory of the
Pacific Islands

"Papua New Guinea has got about 2.3 million people. The build of the country itself--it is a mountainous country--with the population speaking about 700 different dialects should make you aware of the difficulty in communication."

Alkan Tololo
Director
Department of Education
Papua New Guinea

PAPUA NEW GUINEA: REPORT TO THE UNIVERSITY

The experiment in Papua New Guinea is defined as a departmental activity within the PNG University of Technology. This report on the project is condensed from a formal report to the University Administration made in 1974. The reader will get an idea of needs and costs, although naturally, these vary for each situation. Thus, the experience of PNG University of Technology should not be used in projecting future applications elsewhere.

Early interest of Papua New Guinea was stimulated by Dr. Frank Johnson, then Professor of English at the University of Papua New Guinea in Port Moresby. However, difficulties in licensing, under Australian jurisdiction, brought efforts to a halt. A technical experiment was encouraged by the Director of PNG Post and Telegraph, William Carter. The University of Technology was the natural site with responsibilities in the experienced hands of Dr. Steve Seumahu, author of this report, assisted by Ian Fletcher.

EXPERIMENTAL ACTIVITY REVIEW: A DEPARTMENTAL REPORT ON PAPUA NEW GUINEA PARTICIPATION IN THE PEACESAT PROJECT

October 1971—June 1974

E.S. Seumahu
Senior Lecturer in Electronics & Communications
PNG University of Technology

Telecommunications play an important role in a developing country such as Papua New Guinea. The traditional form of telecommunication has been by means of High Frequency (H.F.) radio links. This form of communication suffers the usual deterioration because of short wave propagations and disturbances, ...it is serviceable when the volume of traffic is very low and the speed of communication is not a limiting factor.

The rapidly increasing demand for telecommunication services, however, has forced the PNG Department of Posts & Telegraphs to expand its facilities. Because of the particular geography of Papua New Guinea, conventional telecommunication media, such as open wire lines and coaxial cables, are impractical for this expansion program. Microwave systems have been used to a great advantage, but these systems provide communications among the main administrative and industrial centres only. Village-to-village and village-to-centre communications are practically nonexistent. In some cases, H.F. radio communications are still used for this purpose by Department of Posts & Telegraphs outstations, missionary organizations, medical teams, police, civil defense, and other authorities.

The only other alternative, as far as Papua New Guinea is concerned, for medium-density, good-quality links on a village-to-village or village-to-centre basis is the use of satellite communication. As satellite time becomes cheaper and cheaper, other nations, with similar geographical features to Papua New Guinea, have already opted for this form of communication to cover their domestic and international traffic requirements.

The project was undertaken to gather technical information and gain experience in the field of satellite communications as applied to the Papua New Guinea situation. The project gathered momentum when it was learned in October 1971 that the University of Hawaii had embarked on a similar program to use the U.S. National Aeronautics and Space Administration (NASA) ATS-1 satellite for experimental and educational purposes. The University of Hawaii project became known as the PEACESAT (Pan Pacific Educational and Communication Experiment by Satellite) project under the directorship of Dr. John Bystrom of U.H.'s Department of Speech-Communication.

After consultations with the PEACESAT Project, a simple ground station was assembled in the PNG University of Technology (UT) Department of Electrical Engineering. The department then made formal applications to NASA and the University of Hawaii to join the PEACESAT network. The purpose in joining PEACESAT is to take part in educational, technical, medical, cultural, and public relation exchanges with other institutions in the Pacific and to check the technical performances of the ground station.

Licensing arrangements were finalized with the PNG Department of Posts & Telegraphs and the Australian Postmaster General's Department in August 1972. The commissioning of the ground station took place on 5th August 1972 to coincide with the opening of the Engineering Building at PNGUT. Congratulatory messages were received via the ATS-1 from the University of Hawaii, Manoa and Maui campuses, the University of the South Pacific in Fiji and Tonga, and the Wellington Polytechnic Institute in New Zealand. Final approval from NASA was given in September 1972 for the use of the ATS-1 for both transmission and reception of voice and facsimile.

Since its inauguration in August 1972, the ground station has been used for technical experimentation, data collection, and regular exchanges within the PEACESAT network. The results from these activities have been encouraging and have provided useful experience for the planning and conduct of further experimentations in the future.

Ground Station Configuration

Many configurations for the ground station are possible. For reasons of economy and application, in the Papua New Guinea village situation we need the simplest electronics, lightweight construction, and portability. On the other hand, for reliable communication, the need is for large power outputs and highly efficient directive antennas. Furthermore, the antennas would need to be reasonably fixed in position to ensure good tracking.

To investigate the performances of different configurations, a flexible arrangement is used. This basic arrangement can be adapted very conveniently for 10 watt, 100 watt, and 500 watt configurations. The configuration can also be changed very easily for single or double aerial connection, and for simplex or half duplex operation.

Licensing

The licenses for the ground station were issued by the Australian Postmaster General's Department through the Papua New Guinea Department of Posts & Telegraphs. Under these licenses, the ground station is regarded as an authorized ground station for peaceful purposes. The licenses allow the ground station to be used for technical experimentation

and educational exchanges with other Pacific countries. The station is registered with the International Telecommunication Union (ITU) in Geneva.

Authorized frequencies for the ground station are 149.22 MHz for transmission and 135.60 MHz for reception. Maximum transmitter power allowed is 1000 watts P_m with emission type 30 F9. Two call signs were issued: AX 50--for fixed operation and AX 46--for mobile operation.

Link to Port Moresby

By courtesy of the PNG Department of Posts & Telegraphs, a dedicated line is available, free of charge, on 30 minutes' notice. This line is used for connection of the ground station with a remote terminal in Port Moresby. The line makes use of three telephone channels from PNGUT to Lae telephone exchange and connects with the microwave system to Port Moresby.

Facilities exist for Transmit/Receive switching of the ground station from the remote Port Moresby terminal. Auxiliary equipment for voice, facsimile, and teletype can also be connected at the remote terminal. At the time of this report, the line has been used only for technical tests. It is proposed that the line be used more regularly in the future to enable individuals, organizations, and government authorities in Port Moresby to use the ground station for exchanges with their counterparts in other Pacific countries. .

The listing below shows topics in which our ground station actively participated up to July 1974. The number in parentheses following a topic indicates the number of sessions in which the topic was discussed.

Accounting Curriculum Development (3)
Agricultural Extension & Research (4)
Boy Scout Jamboree (2)
Civil Defense--Earthquake & Tsunami Warnings (2)
Education for Self-Government (2)
Forestry Course Discussions (2)
Hotel Operations (2)
Inaugural Ceremonies (2)
Industrial Electronics & Electrical Trades (3)
Inter-Library Loan Processing (3)
Inter-University Exchange (2)
Journalism Seminar (3)
Language Laboratories (3)
Library Networking Conferences (3)
Medical Consulting (2)
Medical Research in the Pacific (2)
Mock United Nations (Secondary Students) (6)
Nursing Education (4)
Nutrition Value of Seaweeds (2)
Pacific Poetry Hour (3)
Radio News Exchange (6)
Rotary Club Round-up (1)
Teaching English as a Second Language (3)
Technology & Education (1)
Telementry EKG Experimentation (3)

Participating in the PEACESAT Users Conference organized by the East-West Center (Honolulu) are (L to R), Ian Honeyman, Planning Officer, University of the South Pacific; Elias Thomas, Chief, Broadcast Division, Trust Territory of the Pacific Islands; Steve Seumahu, Terminal Manager, University of Technology, Lae, Papua New Guinea; Rod Thompson, Director of Technical Services, Papua New Guinea National Broadcast Commission. April 1975.

Tourism & the Pacific (1)
University Staff Associations (4)
Volcanic Soil Research (3)
World Health Organization (1)

Voice Communication

The use of the ground station in two-way voice communication with other PEACESAT stations has been very successful. Subjective tests conducted with these stations show the following results for the fractions of time that certain qualities were observed (Table 1).

Table 1

Transmitter power	Quality		
	Excellent	Satisfactory	Unsatisfactory
Transmission to Other Ground Stations			
10 W	0	50.0%	50.0%
100 W	44.5%	48.0%	4.5%
500 W	80.5%	17.0%	2.5%
Reception from Other Ground Stations			
10 W	0	25.0%	75.0%
100 W	7.5%	75.0%	17.5%
500 W	47.0%	44.0%	9.0%

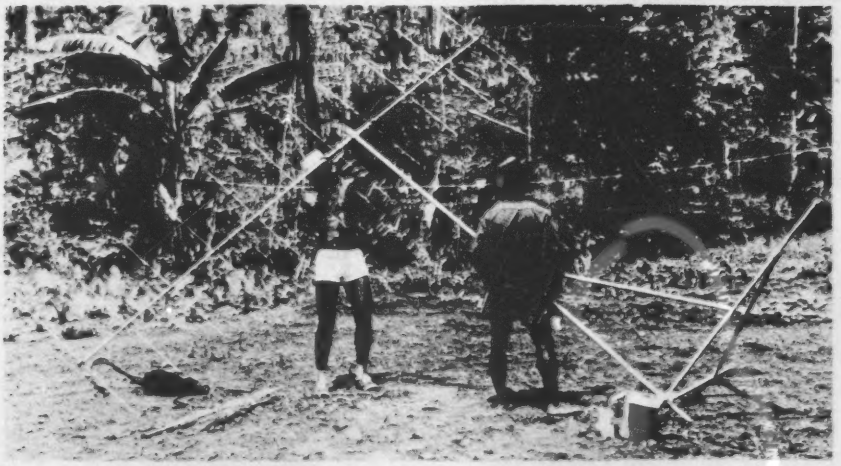
Costs and Funding

Between October 1971 and June 1974, the total amount spent on the project was $2182.91. This is made up of capital and recurrence expenses. The list of capital expenses does not include the cost of the 500 watt amplifier, which was donated by the University of Hawaii.

Conclusions, Comments, and Recommendations

The main conclusion that can be drawn from the satellite communication project so far is that it is possible to design a ground station suitable for use in the Papua New Guinea situation. With a transmitter power of 100 watts and a simple receiver using a readily-made antenna system, the station has very good performance for two-way voice and facsimile communication in VHF band. Satisfactory-to-excellent qualities are achieved for more than 80 percent of the time when the average transponder output

Geographic barriers are removed as a village in Papua New Guinea is linked via satellite to the University at Lae. David Muap, University student, conducted tests as part of a research project in Electrical Engineering. August 1975.



power from the satellite is 20 watts. The prototype station costs about $1100 but could be made cheaper if manufactured in large quantities.

Although it is possible to communicate using only 10 watts of transmitter power from a ground station in emergencies, the quality of reception from the ATS-1 satellite is such that communication is unsatisfactory for about 50 percent of the time.

A 10 watt ground station would be ideal for village-to-village communications because of its low drain on available energy source and its portability. If simpler antennas can be used, then tracking will not be a problem. The cost of a 10 watt prototype station is about $500. However, to enable such a station to give comparable quality to the previous 100 watt system, the satellite power needs to be increased considerably.

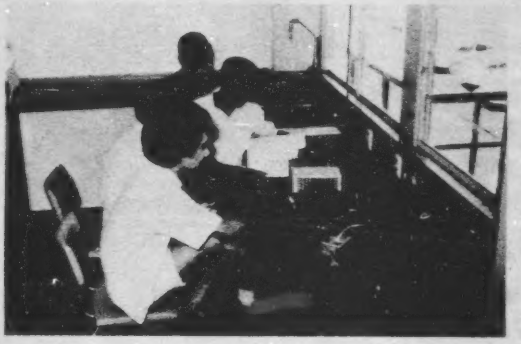
By participating in the PEACESAT Project, the ground station has been put to good use. The PEACESAT program has demonstrated the usefulness of satellite communication in two-way voice and facsimile communication among the Pacific countries. Since its inception, the PEACESAT network has been used extensively and successfully for technical, educational, medical, cultural, and public relation exchanges. The volumes of traffic and the reactions from many users of the system indicate that PEACESAT has served a definite need for communication among the sparsely populated countries of the Pacific where development is still in its infancy and resources are at a premium. Unfortunately, we have not been able to contribute effectively to the PEACESAT program because of lack of finances and facilities. As one of the largest countries in the Pacific, Papua New Guinea has tremendous potential for contribution toward PEACESAT exchanges. In return, Papua New Guinea would benefit greatly from the experiences and expertise of the other Pacific countries.

To exploit the full potential of the PEACESAT program, it is necessary that more funds be made available. It is estimated that $500 would be required to set up simple studio facilities. A suitably air-conditioned sound-proof room is needed to house these facilities and to accomodate the participants. To manage the program schedules, notify participants, collect exchange requests, operate the equipment, and carry out other housekeeping routines, a part-time worker is needed.

Several further experiments are planned for the ground station in the future. One of these involves the use of teletypes for communication of written texts at different speeds and different power levels. Another is planned to study the possible application in computer communication. Measurement of error rates as functions of data speed

"PEACESAT helps with schoolwork and gives a wider outlook."

Jane Quarry
Student
Lae High School
Papua New Guinea



Lae High School students represent Papua New Guinea in Mock United Nations via satellite. June 1973.

and transmitter power will be employed to evaluate the use of a portable ground station as a remote computer terminal. This would enable surveyors, government agencies, and other data collectors to have access to central computing facilities from any location in Papua New Guinea.

The ground station has already been issued with a license for portable operation. This enables the use of the station in future experiment from a real village situation. The plan is to establish a portable station at some remote village in Papua New Guinea where the ATS-1 satellite is "visible" and to carry out a series of voice, facsimile, teletype, and computer communications.

One objective of our project is to evaluate the likely social and economic consequences of the introduction of inexpensive satellite ground stations in Papua New Guinea with particular application in education. Although no work has been done on this so far, it is hoped that such a study would be undertaken in the near future.

It would seem that satellite communication will play an increasingly important role in the future development of Southeast Asia and the Pacific. Our satellite communication project will enable us to keep abreast of the state of the art and take full advantage of the available technology for application in Papua New Guinea.

CLASSROOM INTERACTION

In closing this report we include excerpts from a transcription of an exchange between elementary students separated in some instances by 8000 miles. Dialogue involves elementary school children in New Zealand, Honolulu, and Alaska. In New Zealand there were the classes of Helen Barker and Basil Briggs of Karori West School; Jean Campbell and Marion Marquand of Raora; Adrienne Burleigh of Tawa; and Robin Wright of Evans Bay. Students in Hawaii were drawn from the classes of Shirley Yamashita, University Laboratory School. Dave Evans of Beaver School coordinated Alaska students; and Selwin Moore, Social Studies Supervisor, Wellington Education Board, assisted in Wellington.

Dr. Gerald Meredith, University of Hawaii Evaluation Officer, directed terminal managers and teachers in developing a pre-post word association evaluation for the series of exchanges. Student outcomes included: increased appreciation of the influences of cultural practices on local life styles, increased attention to the manner in which language differences and dialects affect the formation of personal impressions, and increased ability to retain information transmitted via an audio medium.

The transcript is an introduction to reports to be published later that will draw upon the experiences and behavior of users of the system.

Two very different environments in which to grow up are pictured. One is the snow-covered landscape familiar to students above the Arctic Circle in Alaska. The other, a picture of a portable satellite ground terminal being moved by canoe in Papua New Guinea, is familiar to students in equatorial locations. With the global satellite represented by ATS-1—which beams signals from the Arctic to the Antarctic and over 8000 miles East to West—it is possible to carry on conversations at an early age which open personal horizons and broaden understanding of common problems among people.

USE IN ELEMENTARY AND SECONDARY SCHOOLS

Excerpts from Transmissions
November 1973

(Wellington) This is Rachel Hancock speaking. Do you have to buy your water for 8¢ a gallon, and do you still pay tax for the rubbish collector to collect your rubbish?

(Beaver) Water costs $3.00 for 55 gallons, and we burn our garbage.

(Hawaii) I'd like to know how many hours of sunlight you have a day.

(Barrow) I'll tell you a little bit about what it's like up here today. There's no sun. It's pitch black outside. The temperature is about zero. We're in a current flux of another medical epidemic. If you hadn't heard, about two months ago, we had a hepatitis epidemic. Now we're starting to go around with the flu. Right now, our students are watching Electric Company on television and Bill Cosby is teaching the Easy Reader, "Reading Is My Thing." Our students can watch closed-circuit cable television within our school plan. Anyway, although the only programming we're offering right now is Electric Company, we have hopes of putting in a live educational broadcast station within the school's plan some time this year.

(Wellington) What sort of animal life can you find around the place where you live?

(Beaver) In the winter and summer we hunt moose and wolf. In the summer the people of the interior hunt black bears and brown bears. Also in the winter we trap furs from Monnie. The places have wolves. Lynx are worth $100 to $150. Wolves are worth $100 to $170. We also trap foxes, bartons, minks, and weasles.

(Hawaii) Have any of you ever been frightened by a bear when you go hunting?

(Beaver) Mostly the bears run from humans.

(Wellington) Do you live in log cabins in Beaver? That's something I'd like to know. And if so, oh well, what are log cabins like to live in? Okay Beaver, please tell me that, the answer to that question.

(Beaver) Every house in Beaver is a log cabin except the school.

(Wellington) Yes, Susette Banquet. What's the size of Beaver and the population there?

(Beaver) We are hundred people and about thirty houses at the top, and the town is about two miles long.

(Wellington) This is David King. I'd like to know what chores you do around the house for your parents.

(Barrow) The boys bring in the ice so we can have water in the house. The girls do the dishes, sweep the floor, and make their beds.

(Wellington) Is life on Hawaii really as we see it on TV in "Hawaii 5-0" and "Little People"?

(Hawaii) Well, it's not like "Hawaii 5-0" because "Hawaii 5-0," they make the things. . .actually, they're not really true, so they're just making the people act.

(Barrow) What is an aloha shirt?

(Hawaii) It's a shirt that you brighten out, and it's used for the dress shirt, and also you can play in it. It's colorful and has many floral designs. Not always floral designs, even other designs. . .they're colorful.

Wellington students in the Alaska·Hawaii·New Zealand cultural exchange series. Slides and audio tapes describing life in each country were exchanged by mail prior to the two-way satellite dialogues. November 1973.

(Beaver) How many elementary-school students do you have in Hawaii?

(Hawaii) 5,000.

(Hawaii) Nolan thinks 5,000. What do you think?

(Hawaii) 4,000?

(Hawaii) Okay, we're just not quite sure, but we have a considerable group of students here in Hawaii.

(Beaver) That's quite a few. We only have 32 students in Beaver.

(Beaver) This is Doris Cretchet from Beaver. My question is, what is the national anthem of New Zealand?

(Wellington) Who would like to answer that? Well, here's someone looking at. . .okay.

(Wellington) Hello, I'm Sidney. The national anthem is "God Bless the Queen."

Hawaii aloha spirit shared via satellite. May 1973.

Lunalilo Elementary School students are surprised to learn Alaskans refer to the rest of U.S. as "lower 49." May 1973.

STAFF

Local Terminal Staff: British Solomons: Mostyn Habu, Terminal Manager; Hazel Lulei, Terminal Operator; *Cook Is.:* Stuart Kingan, Terminal Manager; Tereapii Kingan, Terminal Operator; *Fiji:* Gilda Benstead, Terminal Manager; Dick Northcott, Technical Consultant; *Gilbert Is.:* Temaroiti Rameti, Terminal Manager; *Hawaii, USA: (Honolulu)* Carol Misko, Manager University Operations; Donald Nakano, Chief Engineer; Calvin Hirai, Gary Viveiros, Terminal Operators; Katashi Nose, Technical Consultant; *(Maui)* Walter Ouye, Terminal Manager; *Kingdom of Tonga:* Kaveinga Havea, Terminal Manager, 'Anau Fanua, Terminal Operator; *New Caledonia:* Pat Mahony, Terminal Manager; Beth BuBois, Fran Mahoney, Terminal Operators; *New Hebrides:* Roslyne Pedro, Terminal Manager; *New Zealand:* Anthony Hanley, Terminal Manager; Elsa Flavell, Terminal Operator; *Niue Is.:* Rodney Spooner, Terminal Manager; Alofa Tafatu, Terminal Operator; *Papua New Guinea: (Lae)* Steve Seumahu, Terminal Manager, Ian Fletcher, Terminal Operator; *(Port Moresby)* Coleman Moni, Terminal Manager; *Trust Territory of the Pacific Islands:* George Callison, Terminal Manager; Elias Thomas, Chief, Broadcast Division.

Project-wide Staff: John Bystrom, PEACESAT Director; Anthony Hanley, Associate Director; Paul Yuen, Technical Director.

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"The satellite experiment has been very helpful to the South Pacific Commission in monitoring disease conditions and responding very quickly to potential epidemics in different areas."

Frank Mahony
Social Program Director
South Pacific Commission

Dr. Leon Rosen, Head, Pacific Research Section, National Institutes of Health (left), began Dengue virus epidemic control communications in 1971. Dr. Guy Loison, Health Director for South Pacific Commission, was instrumental in efforts to obtain a terminal at Commission headquarters in Noumea, New Caledonia. June 1973.

"What we'd like to see is a network, a communication network, for health, education, and welfare services...In the field of health, we are, at present, concerned about the dissemination of certain communicable diseases throughout the Pacific because of the improvements in transportation. With the opening up of the various islands to aircraft, transmission of disease will be quite easy and rapid."

Dr. Joseph Williams, M.D.
Cook Islands

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